



AVALON™

Analog Bassline Synthesizer





AVALON™

Analog Bassline Synthesizer

REFERENCE MANUAL

v1.0
JULY 2015

Information contained in this manual is subject to change without notice. No part of this manual may be reproduced or transmitted in any form, or by any purpose other than the purchaser's personal use, without the express written consent of Abstrakt Instruments LLC.

All other product and company names used in this manual are trademarks or registered trademarks of their respective owners.

© 2015 Abstrakt Instruments
www.abstraktinstruments.com

Abstrakt
Instruments®
Vintage Sound. Modern Design.™

IMPORTANT SAFETY AND MAINTENANCE INSTRUCTIONS

Read all instructions below and follow them.

- 1.** Do not use this product near water - for example, in the rain, near a bathtub or sink, in a wet basement, or near a swimming pool or the like.
- 2.** This product, in combination with an amplifier and headphones or speakers, may be capable of producing sound levels that could cause permanent hearing loss. Do not operate for a long period of time at a high volume level or at a level that is uncomfortable.
- 3.** Never use aggressive cleaners on the casing. Remove dust, dirt, and fingerprints with a soft, dry, non-abrasive cloth. If the unit is persistently dirty use a slightly damp cloth using only water. Do not use a liquid cleaner, alcohol, acetone, turpentine, or any other organic solutions.
- 4.** Install in accordance with the instructions. Make sure you place the unit on a stable surface before use.
- 5.** The product should be located away from heat sources such as radiators, heat registers, or other products that produce heat.
- 6.** Connect the unit to an easily accessible electrical outlet that is close to it.
- 7.** The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.
- 8.** Unplug the unit during lightning storms or when it is not used for long periods of time.
- 9.** Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
- 10.** When transporting the unit, use accessories recommended by the manufacturer or the original box and padding.
- 11.** Abstrakt Instruments is not responsible for any damage caused by improper operation of the instrument.

WARNING

To reduce the risk of fire, electrical shock or product damage:

- Do not expose the unit to rain, moisture, dripping or splashing. Also avoid placing objects filled with liquid, such as vases, on the unit.
- Do not expose the unit to direct sunlight, nor use it in ambient temperatures exceeding 30°C as this can lead to malfunction.
- Do not open the casing. There are no user repairable or adjustable parts inside. Leave service and repairs to trained service technicians only.

EXTERNAL POWER SUPPLY SAFETY INSTRUCTIONS

- The adapter is not safety grounded and may only be used indoors.
- To ensure good ventilation for the adapter, do not place it in tight spaces. To prevent risk of electric shock and fire because of over-heating, ensure that curtains and other objects do not prevent adapter ventilation.
- Do not expose the power adapter to direct sunlight, nor use it in ambient temperatures exceeding 40°C.
- In the EU, only use CE approved power cords.



Tested To Comply
With FCC Standards
FOR OFFICE USE



This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union regulation compliance statement

This product has been tested to comply with the Low Voltage Directive 2006/95/EC and the Electromagnetic Compatibility Directive 2004/108/EC. The product meets the requirements of RoHS 2 Directive 2011/65/EU.

This symbol indicates that your product must be disposed of properly according to local laws and regulations.



CONTENTS

1 INTRODUCTION	7	5.2.4.2 ACCENT & SLIDE	19
1.1 ABOUT THIS MANUAL	7	5.2.4.3 TRANSPOSE	19
1.2 ABBREVIATION & CONVENTIONS	7	5.2.4.4 MODULATION ENVELOPE TRIGGERS	19
1.2.1 BUTTON NAMES	7	5.2.4.5 SLIDE TIME	19
1.2.2 BUTTON COMBINATIONS (SIMULTANEOUS)	7	5.2.4.6 FILTER CV OFFSET	19
1.2.3 STEP BUTTONS	7	5.2.4.7 GATE LENGTH	20
1.2.4 CHROMATIC KEYBOARD	7	5.2.5 TIME ATTRIBUTES	20
1.2.5 PATTERN BUTTONS	7	5.2.5.1 NOTE EVENTS	20
1.2.6 BUTTONS 1-4	7	5.2.5.2 NOTE LENGTH, TIES & RESTS	20
1.2.7 NOTE, TIE, & REST BUTTONS	8	5.2.5.3 ACTIVE STEPS	20
1.2.8 NEXT & BACK BUTTONS	8	5.3 PITCH & TIME STEP ENTRY MODES	21
1.2.9 ROTARY KNOBS	8	5.3.1 PITCH STEP ENTRY	21
1.2.10 LED INDICATORS	8	5.3.2 TIME STEP ENTRY	21
2 OVERVIEW	9	5.4 RECORD MODE	21
2.1 FRONT PANEL	9	5.4.1 ENTER & EXIT RECORD MODE	21
2.2 REAR PANEL	10	5.4.2 RECORDING REALTIME PERFORMANCE	21
2.3 INITIAL CONNECTIONS	10	5.4.2.1 RECORD NOTES	22
3 ANALOG SYNTH	11	5.4.2.2 RECORD TRANSPOSE	22
3.1 ZERO THE SYNTHESIZER	11	5.4.2.3 RECORD ACCENT & SLIDE	22
3.2 OSCILLATOR	11	5.4.2.4 RECORD MOD ENV	22
3.3 FILTER	11	5.4.2.5 RECORD SLIDE TIME	22
3.4 FILTER ENVELOPE	12	5.4.2.6 RECORD FILTER CV OFFSET	22
3.5 AMPLIFIER	12	5.5.1 REALTIME ACCENT & SLIDE	22
3.6 MODULATION ENVELOPE	12	5.5.2 REALTIME MOD ENV	22
3.7 OUTPUT	12	5.6 ARPEGGIATOR	23
4 SEQUENCER OVERVIEW	13	5.6.1 ARP ON/OFF	23
4.1 PRIMARY MODES	13	5.6.2 NOTE ENTRY	23
4.1.1 CHANGING PRIMARY MODES	13	5.6.2.1 VIA AVALON KEYBOARD	23
4.1.1.1 BETWEEN PATTERN MODES	13	5.6.2.2 VIA EXTERNAL MIDI	23
4.1.1.2 BETWEEN TRACK MODES	13	5.6.3 ARP MODE	23
4.1.1.3 BETWEEN PATTERN & TRACK MODES	13	5.6.4 REALTIME ACCENT, SLIDE, & MOD ENV	23
4.2 WHAT IS A PATTERN?	13	5.6.5 ARP RECORD	23
4.2.1 THE PATTERN STEP	13	5.7 PATTERN SYSEX DUMP	23
4.2.2 PATTERN STEP ATTRIBUTES	13	5.7.1 TRANSMIT	23
4.2.3 PATTERN MODIFIERS	13	5.7.2 RECEIVE	23
4.2.4 PATTERN OVERALL STRUCTURE	14	6 PATTERN PLAY MODE	24
4.3 PATTERN SELECTION	14	6.1 OVERVIEW	24
4.3.1 PATTERN BANK	14	6.2 NORMAL MODE	24
4.3.2 PATTERN GROUP	14	6.2.1 PATTERN SELECTION	24
4.3.3 PATTERN NUMBER	14	6.2.2 PATTERN CHAINING	24
4.4 PATTERN PLAYBACK	14	6.3 REALTIME MODE	24
4.4.1 TEMPO	14	6.3.1 TRANSPOSE	24
4.5 WHAT IS A TRACK?	15	6.3.2 REALTIME ACCENT & SLIDE	25
4.6 TRACK SELECTION	15	6.3.3 REALTIME MOD ENV	25
4.7 TRACK PLAYBACK	15	6.3.4 REALTIME MUTE	25
5 PATTERN WRITE MODE	16	7 TRACK WRITE MODE	26
5.1 OVERVIEW	16	7.1 OVERVIEW	26
5.2 NORMAL MODE	16	7.2 SELECTING TRACKS	26
5.2.1 PATTERN CLEAR, COPY & PASTE	16	7.3 NORMAL MODE	26
5.2.2 PATTERN CHAINING	17	7.3.1 TRACK STEP INDICATORS	26
5.2.3 PATTERN MODIFIERS	17	7.3.2 LAST TRACK STEP	26
5.2.3.1 PATTERN LENGTH	17	7.3.3 TRACK CLEAR, COPY & PASTE	27
5.2.3.2 LAST STEP	17	7.3.4 WRITING A TRACK	27
5.2.3.3 TIME SIGNATURE	17	7.3.4.1 SELECT PATTERN	27
5.2.3.4 SHUFFLE	18	7.3.4.2 TRANSPOSE	27
5.2.3.5 PATTERN DIRECTION	18	7.3.4.3 ADD REPEATS	27
5.2.3.6 PATTERN ROTATE	18	7.3.4.4 PREVIOUS & NEXT STEP	27
5.2.3.7 PATTERN RANDOMIZE	18	7.3.4.5 LAST STEP	28
5.2.3.8 PATTERN TRANSPOSE	18	7.3.4.6 INSERT & DELETE	28
5.2.3.9 FILTER B MODE	18	7.3.4.7 SETTING D.S. AND %	28
5.2.4 PITCH ATTRIBUTES	19	7.4 REALTIME MODE	28
5.2.4.1 PITCH	19	7.4.1 REALTIME ACCENT & SLIDE	28

7.4.2 REALTIME MOD ENV	28
7.4.3 REALTIME MUTE.....	29
7.5 TRACK SYSEX DUMP	29
7.5.1 TRANSMIT	29
7.5.2 RECEIVE.....	29
8 TRACK PLAY MODE.....	30
8.1 OVERVIEW	30
8.2 SELECTING TRACKS	30
8.3 NORMAL MODE	30
8.3.1 TRACK STEP INDICATORS	30
8.4 REALTIME MODE.....	30
8.4.1 REALTIME ACCENT & SLIDE	30
8.4.2 REALTIME MOD ENV	30
8.4.3 REALTIME MUTE.....	30
9 MIDI PLAY	31
9.1 STOP THE SEQUENCER	31
9.2 SET MIDI INPUT CHANNEL.....	31
9.3 DISABLE MIDI SYNC	31
9.4 MIDI RECEIVE PARAMETERS	31
9.4.1 NOTE ON / ACCENT/ SLIDE	31
9.4.2 VCA LEVEL.....	31
9.4.3 FILTER CUTOFF	31
9.4.4 MODULATION ENVELOPE TRIGGER	31
10 CONFIGURATION MODE	32
10.1 ENTER CONFIG MODE	32
10.1.1 SYNC INPUT.....	32
10.1.1.1 MIDI SYNC IN BEHAVIOR	32

10.1.2 SYNC OUTPUT	32
10.1.3 MIDI INPUT CHANNEL.....	32
10.1.4 MIDI OUTPUT CHANNEL	32
10.1.5 USB MIDI	32
10.1.6 LED DIMMING	32
10.2 EXIT CONFIG MODE	32
11 INPUTS & OUTPUTS	33
11.1 AUDIO I/O.....	33
11.2 CV & GATE I/O	33
12 SPECIFICATIONS.....	34
13 TB-303 SETTINGS.....	35
13.1 ANALOG VOICE	35
13.1.1 OSCILLATORS	35
13.1.2 FILTER	35
13.1.3 FILTER ENVELOPE.....	35
13.1.4 VCA ENVELOPE	35
13.1.5 MODULATION ENVELOPE	35
13.2 SEQUENCER.....	35
13.2.1 PATTERN WRITE MODES.....	35
13.2.2 PATTERN MODIFIERS	35
13.2.3 PATTERN STEP ATTRIBUTES	35
14 BLOCK DIAGRAM	35
APPENDIX A - CALIBRATION	37
APPENDIX B - FILTER & VCA BEHAVIOR.....	39
APPENDIX C - AVALON VS. TB-303 SEQUENCER.....	43
APPENDIX D - MIDI IMPLEMENTATION.....	44

1 INTRODUCTION

Thank You for purchasing the Avalon Bassline Synthesizer! The Avalon is a powerful synth and sequencer designed to be equally at home in the studio or in live performance.

Be sure to visit www.abstraktinstruments.com for the latest firmware and tutorials.

1.1 ABOUT THIS MANUAL

This manual was written to help familiarize you with Avalon synthesizer. There are a lot of features packed into the Avalon, we recommend reading this manual in its entirety.

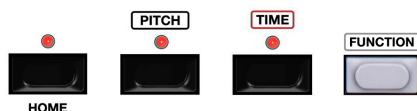
1.2 ABBREVIATION & CONVENTIONS

i Additional info on a given topic.

tip Tips to simplify specific topics.

1.2.1 BUTTON NAMES

Button names are illustrated in bold uppercase. For example, the button labeled "home" is written **HOME**. Buttons that are specific to "pitch", "time" or secondary "functions" are typed in color-coded brackets, such as **[PITCH]**, **[TIME]** and **[FUNCTION]**.



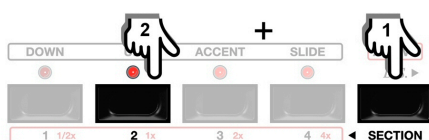
1.2.2 BUTTON COMBINATIONS (SIMULTANEOUS)

Whenever multiple buttons are to be pressed simultaneously the "+" sign is used. The first button name is the first button pressed. The second button name after the "+" sign is the second button pressed (while holding the first button). In some cases there are additional button presses.

For example, to clear a pattern the "function" and "clear" buttons are pressed in order as shown below. This would be written as **[FUNCTION] + [CLEAR]**, and illustrated as shown below:



In some instances button combinations are indicated using the "finger point" graphic. In these instances the order of button presses is indicated by the number of each hand. For example, **SECTION + BUTTON 2** is equivalent to the graphic below.

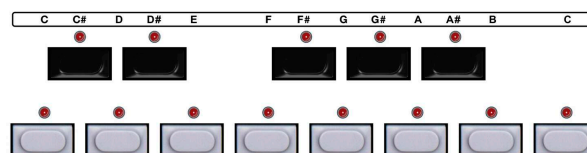


1.2.3 STEP BUTTONS



The (16) step button indicators are used for entering various step attributes. They are also used for certain secondary functions such as setting MIDI channels and Sync modes. The step buttons will be abbreviated as STEP BUTTON * in bold font where "*" denotes the step number. For example "step button 4" would be denoted **STEP BUTTON 4**.

1.2.4 CHROMATIC KEYBOARD

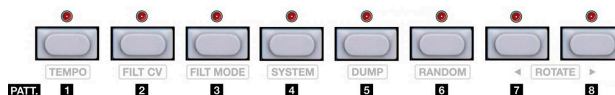


The buttons that make up the one octave keyboard are used for multiple functions. Whenever they are used for pitch (note) entry the buttons will be denoted by **[BUTTON KEY *]** in bold font. For example, when referring to the "C#" key it would be written **[BUTTON KEY C#]**.

i The upper C is denoted **[BUTTON KEY C']**.

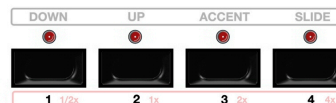
1.2.5 PATTERN BUTTONS

The "white" keys of the chromatic keyboard are used for pattern selection. Whenever the pattern 1-8 buttons are used in reference to pattern selection they will be denoted by **PATTERN BUTTON *** in bold font. For example, when referring to pattern 6 it would be written as **PATTERN BUTTON 6**.



1.2.6 BUTTONS 1-4


The black buttons labeled 1-4 are used for various duties such as selecting pattern sections, pattern time signature, and for setting gate lengths and slide times per step.





When these buttons are referenced they are written **BUTTON 1**, **BUTTON 2**, **BUTTON 3**, & **BUTTON 4**. When referred to as a group they are written **BUTTON 1-4**.

1.2.7 NOTE, TIE, & REST BUTTONS

The note, tie and rest buttons are indicated by musical notation on the control surface of the Avalon. When used in this manual these buttons will be written **NOTE**, **TIE** and **REST**.

NOTE = •  (16th note symbol)

TIE = ○  (16th tie symbol)

REST =  (16th rest symbol)

1.2.8 NEXT & BACK BUTTONS

The Avalon has NEXT and BACK operations that are used in some modes. These buttons are not labeled with text, but rather with direction arrows (►◄) as shown below. When used in this manual these buttons will be written **NEXT ►** and **◄ BACK**.



1.2.9 ROTARY KNOBS

Rotary knob names are shown in uppercase bold italic. For example the "tune" control would be written as ***TUNE***.

1.2.10 LED INDICATORS

LED states are illustrated below.

☀ Fully Lit

☼ Dimly Lit

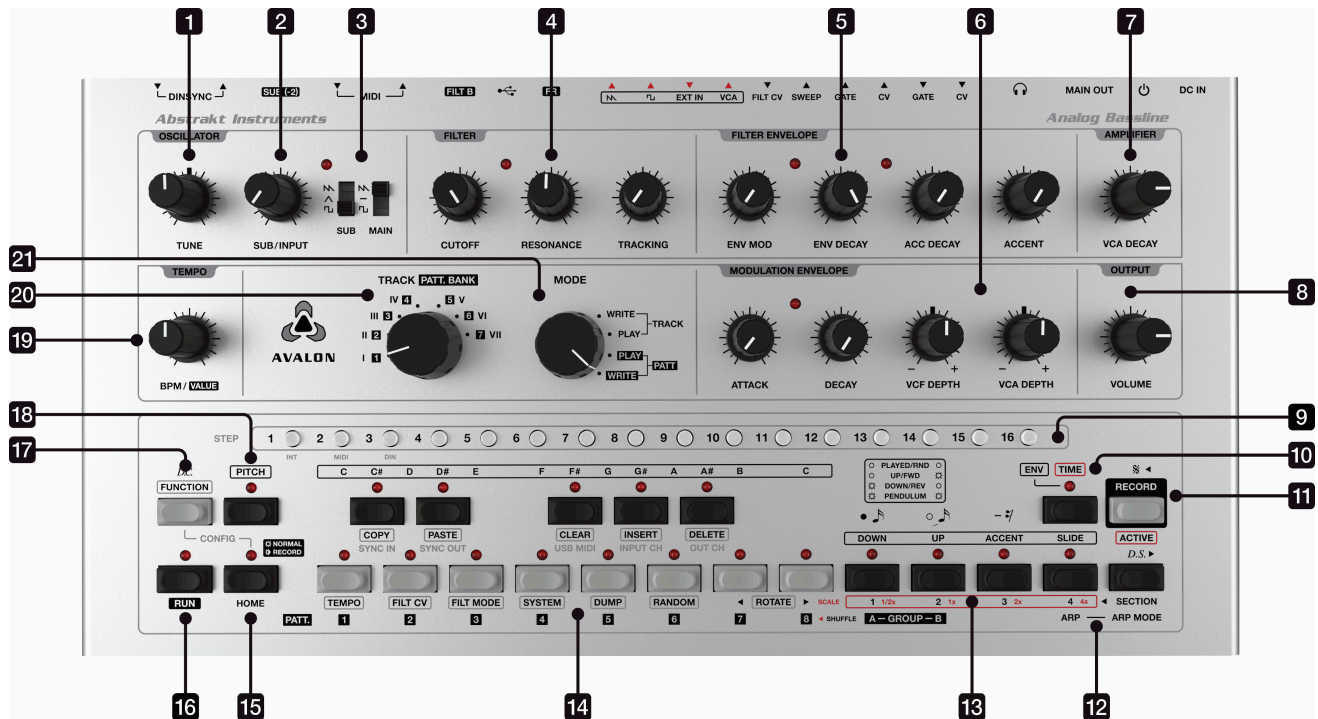
⚡ Blinking

○ Off

LED indicators are illustrated by their function. This usually corresponds to the button text above or below the LED. For example, the accent led above the accent button would be written as **[ACCENT LED]**.

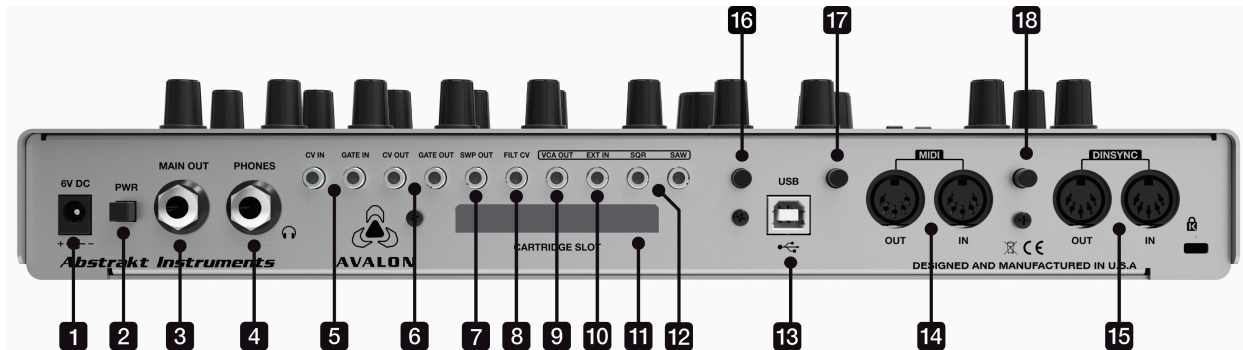
2 OVERVIEW

2.1 FRONT PANEL



- [1] **TUNE** control sets the master tune of the oscillators.
- [2] **SUB/INPUT** sets the level of the sub oscillator or external input.
- [3] **WAVEFORM** switches select the waveshape for the main and sub oscillators. The main oscillator can be selected between saw, square and off. The sub oscillator can be selected between saw, triangle, and square waveforms.
- [4] **FILTER** controls are used to set the cutoff, resonance and key tracking amounts.
- [5] **FILTER ENVELOPE** controls are used for setting the filter envelope decay times, modulation depth, and accent amount.
- [6] **MODULATION ENVELOPE** controls are used for setting the attack and decay times of the modulation envelope and for setting the modulation depth to the filter and final amplifier.
- [7] **VCA DECAY** sets the decay time of the VCA envelope.
- [8] **VOLUME** sets the output level to the main output and headphones.
- [9] **STEP BUTTONS** are used to select and display sequence step parameters.
- [10] **TIME** is used to enter TIME related parameters and for entering TIME ENTRY mode for step input.
- [11] **RECORD** is used to record realtime performance into a sequence.
- [12] **ARP - ARP MODE** are used for enabling the arpeggiator and setting the arp direction.
- [13] **BUTTONS 1-4** are used when selecting parameters such as pattern sections, time signatures, pattern & arp directions, and various pitch and time step attributes.
- [14] **KEYBOARD** is used for selecting the pitch of notes. The white keys together with the GROUP A/B buttons and PATT. BANK selector are also used for pattern selection.
- [15] **HOME** is used to return the sequencer back to NORMAL MODE for each primary mode.
- [16] **RUN** is used to start and stop the sequencer.
- [17] **FUNCTION** is used when selecting various alternate functions.
- [18] **PITCH** is used to enter PITCH related parameters and for entering PITCH ENTRY mode for step input.
- [19] **TEMPO** sets the bpm of the sequencer when using internal sync.
- [20] **TRACK / PATT. BANK** selects the current track or pattern bank.
- [21] **MODE** selects the sequencer primary mode.

2.2 REAR PANEL



[1] **DC POWER** connector for connecting the external 6VDC PSU.

[2] **PWR** switch for turning the machine on and off.

[3] **MAIN OUT** is a 1/4" unbalanced jack for connecting the main output to the sound system.

[tip] Make all audio connections *before* you turn on the power to your audio mixer or amplifier. Turn *on* the power of your powered speaker or amplifier *last*. Turn *off* the power of your powered speaker or amplifier *first*.

[4] **PHONES** is a stereo 1/4" output jack for connecting headphones.

[5] **CV & GATE IN** are 1/8" mono jacks used for are used for sending the Avalon's sequencer/keyboard CV & GATE to external analog gear.

[6] **CV & GATE OUT** are 1/8" mono jacks that output sequencer pitch CV and gate. The CV output is 1V/Oct and the range is 0V to 5V. The gate output is a 0-12V V-trigger.

[7] **SWP OUT** is a normalized copy of the accent sweep control voltage that is derived on accented notes. The output is 0V to 5V max.

[8] **FILT CV** accepts a CV input for controlling filter cutoff frequency. The response is 1V/Oct. The useful range is 0-5V.

[9] **VCA OUT** is the output signal from the VCA.

[10] **EXT IN** is an audio input to the filter. It accepts a wide range of signal levels as it has an internal preamp stage. When the external input is used the sub oscillator is bypassed.

[11] **CARTRIDGE SLOT** is used for optional filter cartridges.

[12] **SAW** and **SQR** are +/-5V buffered outputs from the oscillator.

[13] **USB** class compliant port for connection to a PC or Mac.

[14] **MIDI** jacks for MIDI input & output.

[15] **DINSYNC** jacks for DINSync input & output.

[16] **FR** selects the low frequency response of the audio between normal and extended range. Normal range is -6dB @ 70Hz. Extended range is -6dB @ 30Hz.

[17] **FILT B** selects between the internal filter and a filter cartridge. When the switch is pushed in (enabled) the filter cart is selected. If FILT B is selected and there is no filter cartridge inserted there will be no audio output from the synth.

[18] **SUB (-2)** selects the octave of the sub oscillator between (-1) and (-2) octave. When the switch is pushed in (-2) octaves is selected.

2.3 INITIAL CONNECTIONS

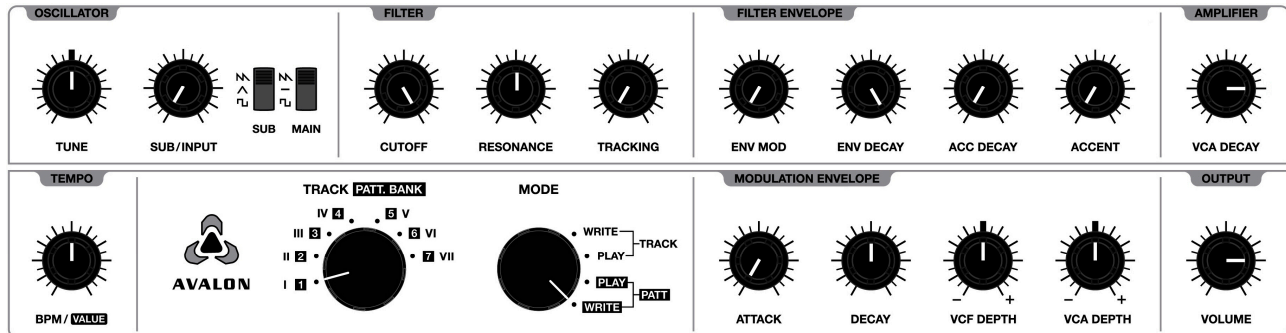
AUDIO OUTPUTS. To hear the audio output from the synth you will need to use headphones or connect the main output to your sound system.

POWER. Turn on the unit. The step indicators will splash a startup pattern.

3 ANALOG SYNTH

3.1 ZERO THE SYNTHESIZER

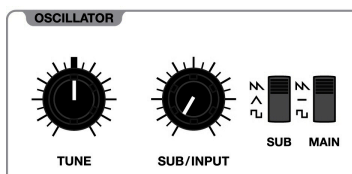
Before starting to program a pattern it is a good idea to reset the analog synth voice to the default settings to ensure sound will be heard when a pattern is played.



The analog voice of the Avalon is backwards compatible with the Roland® TB-303. The additional features can be viewed as a *layer on top* of the original TB-303 which greatly expand the capabilities without being cumbersome or overwhelming. Together with the external filter cartridges from the Synth Cartridge System™ the Avalon is an extremely flexible mono synth with capabilities far beyond the TB-303 subset of sound and performance.

The analog controls are laid out in a straightforward manner.

3.2 OSCILLATOR

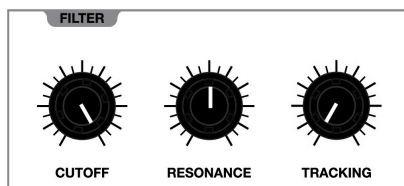


TUNE sets the master tune of the oscillators. The range of the control is +/- 500 cents.

SUB/INPUT controls the level of the Sub Oscillator. When the external input is used the Sub Oscillator is bypassed and it controls the external input level.

The **SUB** and **MAIN** switches select the waveform for the main and sub oscillators. When the main oscillator switch is set to the center position the main oscillator is turned off. The **SUB (-2)** switch selects the sub oscillator between (-1) and (-2) octaves. When the switch is pushed to the "in" position the sub oscillator is set to (-2) octaves and the indicator lights up for visual confirmation.

3.3 FILTER



CUTOFF adjusts the cutoff frequency of the filter. The internal filter is a low-pass diode ladder filter (TB-303), so in this case it controls the low-pass cutoff frequency. External filter cartridges may have any topology, so in these cases the **CUTOFF** control may relate to high-pass, low-pass, band-pass, or notch frequency depending on the topology and filter mode of the cartridge being used.

RESONANCE sets the emphasis amount at the cutoff frequency.

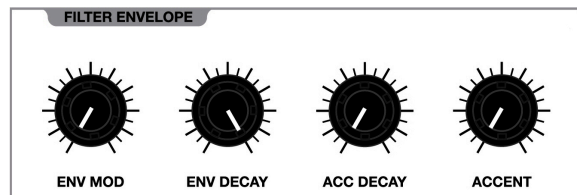
TRACKING sets the key tracking amount. This determines how much the filter cutoff frequency tracks the keyboard. The tracking is purposely non-linear with regards to keyboard scaling, so a one octave increase in key pitch will never correspond to a one octave increase in filter cutoff frequency for all notes. It is desirable to have a greater response at lower octaves in a bassline synthesizer. In the case of the Avalon the tracking is logarithmic, so tracking becomes progressively greater at lower octaves and progressively gradual at higher octaves. The changeover key for tracking is D#2 (77.78Hz), so as tracking is increased notes below D#2 will decrease the filter cutoff frequency and notes above it will increase the cutoff frequency.

The switch labeled **FILT B** is a hardware switch that selects between the internal TB-303 filter and an external filter residing on an optional filter cartridge. When the switch is in the 'out' position the internal filter is selected. When the switch is pushed to the 'in' position the filter plugin cartridge is selected and the LED indicator in the filter section lights up for visual confirmation that the external cartridge has been selected.

The **FR** switch stands for *frequency response (or full range)* and selects the low frequency response of the audio signal to the VCA. When the switch is in the 'out' position the frequency response rolls off at 70Hz. When the switch is pushed to the 'in' position the frequency response extends down below 30Hz.

i The frequency response of the audio signal to the final amplifier in the TB-303 (and hence the Avalon w/ default setting) is limited to ~70Hz. This was done to maximize the signal-to-noise performance of the TB-303 by removing the low frequency component of the signal that would drive it into clipping faster. If exact TB-303 clone behavior is desired this switch should be left in the 'out' position. However, for a full-range response, especially when using the sub oscillator, you may want to extend the frequency response.

3.4 FILTER ENVELOPE



The filter envelope is a simple decay envelope. **ENV MOD** controls the depth of the envelope modulation. **ACC DECAY** and **ENV DECAY** set the decay time of the filter envelope for accented and unaccented notes respectively. In both cases the decay time can be adjusted between 200ms and 2s.

i The implementation of the filter envelope and filter modulation in general is non-standard. For specific details please see Appendix B.

i The original TB-303 does not allow the filter envelope modulation to be turned all the way off. The Avalon has an internal switch setting that allows the filter envelope depth to maintain the TB-303 behavior. See Appendix A for details.

When an accent has been programmed (or played) an additional control voltage (envelope) is sent to the filter and final amplifier (VCA). First, a copy of the filter envelope is sent to the VCA control input to give a volume boost on accented notes. Second, a slewed copy of the filter envelope is sent to the filter control input. This is responsible for the characteristic wow sounds you can get with accented notes. The character of this slewed version also varies with the setting of the **RESONANCE** control, as increasing resonance also increases the slew of this control voltage. The depth of this additional accent modulation is determined by the **ACCENT** control.

i For specific details on the behavior of accents on the filter and amplifier see Appendix B.

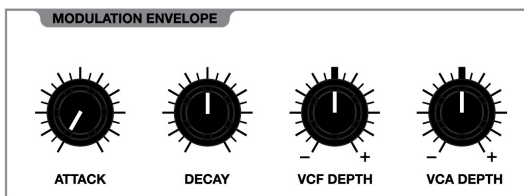
3.5 AMPLIFIER



VCA DECAY sets the decay time of the final amplifier (VCA) envelope. The control ranges from off to 4s decay time.

i The VCA Envelope is identical to TB-303. While the decay time is variable in the case of the Avalon, the attack is fixed to retain the behavior of the TB-303. This envelope can be turned completely off by setting VCA DECAY to the minimum setting.

3.6 MODULATION ENVELOPE



The modulation envelope is an additional attack-decay (AD) envelope that can be used to modulate the filter and the final amplifier (VCA). In addition to the dedicated filter and amp decay envelopes, this modulation envelope allows for more complex modulation. The modulation is bipolar and the envelope can be triggered on any step of a sequence and manually in REALTIME modes.

ATTACK and **DECAY** set the attack and decay time of the envelope. The attack time ranges from 0.9ms to 6s. The decay time ranges from 1.7ms to 10s.

VCF DEPTH and **VCA DEPTH** sets the amount of positive (+) or negative (-) envelope modulation to the filter and VCA respectively.

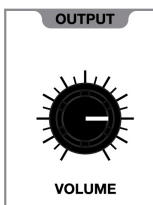
VCF DEPTH has been designed with a progressive voltage offset for increasing (+) or (-) modulations amounts. When the control is rotated clockwise for (+) modulation a *negative* offset is applied to the filter control input. Likewise, as an increasing (-) modulation amount is set by rotating the control counter-clockwise a *positive* offset is applied to the filter control input. See Appendix B for more details.

VCA DEPTH has been designed with a progressive voltage offset for negative (-) modulation amounts. When the control is rotated counter-clockwise for (-) modulation a *positive* offset is applied to the VCA control input. See Appendix B for more details.

i The VCA Depth implementation as described above and in Appendix B allows the VCA to be opened (drone mode) by setting the control for maximum (-) modulation.

i A key feature of the Avalon is the triggering of the modulation envelope via the sequencer. The term "MOD ENV" as used in this manual refers to programming or playing a modulation envelope trigger. This should not be confused with "ENV MOD", which is the name given to the filter envelope depth control.

3.7 OUTPUT



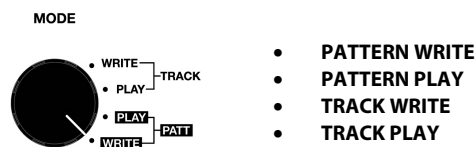
VOLUME controls the output level.

tip There is a discrete "mixer" stage after the volume control. This is a carryover from the TB-303 which has a Mix Input before the output jack. In order to retain the same behavior the Avalon incorporates this same circuit. This stage clips asymmetrically and can clip easily. If you hear unwanted distortion in the main or phones outputs try turning down the volume control.

4 SEQUENCER OVERVIEW

4.1 PRIMARY MODES

The sequencer has (4) primary modes as indicated by the **MODE** switch:



4.1.1 CHANGING PRIMARY MODES

The primary mode can be changed in realtime while the sequencer is running.

4.1.1.1 BETWEEN PATTERN MODES

When changing the primary mode between pattern write and pattern play modes the current pattern or pattern chain continues to play uninterrupted.

4.1.1.2 BETWEEN TRACK MODES

When changing the primary mode between track write and track play modes the current track continues to play uninterrupted.

4.1.1.3 BETWEEN PATTERN & TRACK MODES

When changing the primary mode from a track mode to a pattern mode, the selected pattern will begin in sync at the end of the current track step.

When changing the primary mode from a pattern mode to a track mode, the selected track will start in sync after the current pattern or pattern chain.

4.2 WHAT IS A PATTERN?

Before continuing with details on pattern editing it is necessary to understand the structure of a pattern. A pattern is a sequence of pitch and time events, or steps.

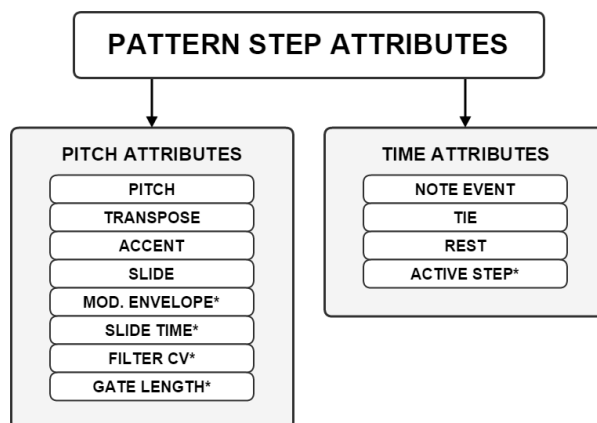
4.2.1 THE PATTERN STEP

As is the case with traditional *step sequencers*, the PATTERN STEP is the fundamental parameter of a pattern, representing a musical event, such as a 1/16th note. Pattern steps relate directly to the (16) lighted **STEP BUTTONS** on the control surface. These buttons are a linear time representation of the pattern:



4.2.2 PATTERN STEP ATTRIBUTES

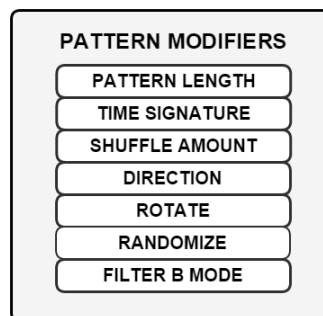
Various pitch and time attributes can be entered for each step as shown in the diagram below:



* attributes not found on the TB-303

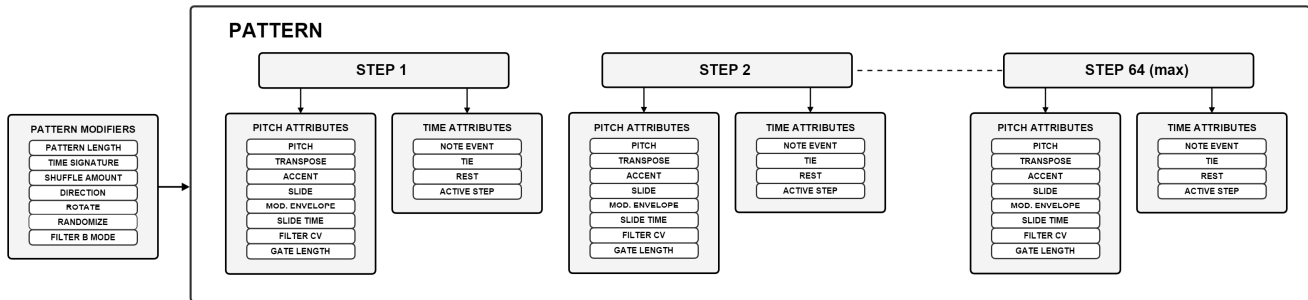
4.2.3 PATTERN MODIFIERS

In addition to *per STEP* attributes there are top level pattern modifiers. These are settings that are performed on the entire pattern as opposed to the individual steps. These include parameters such as the time signature and pattern length. These settings are saved with each pattern.



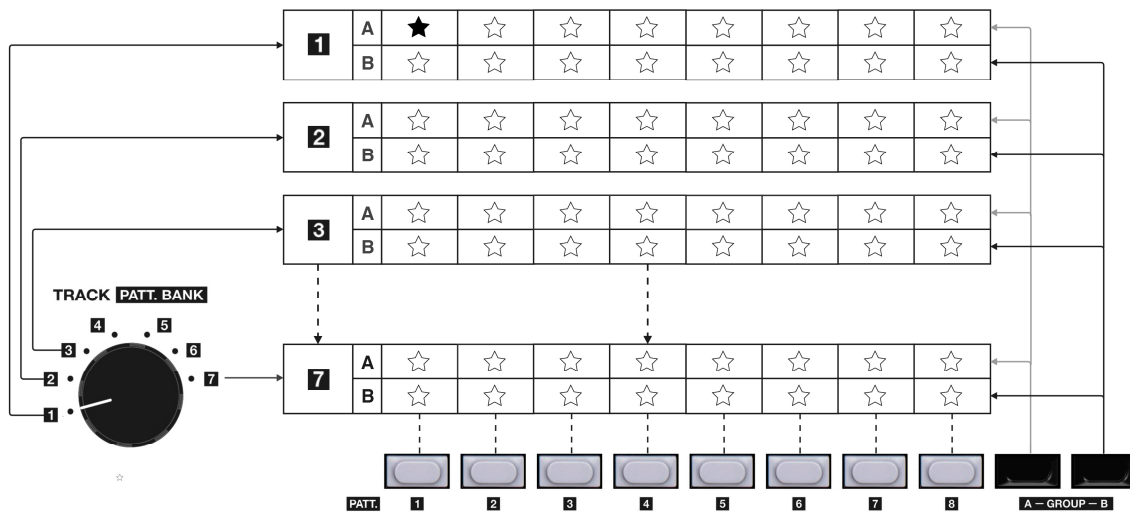
4.2.4 PATTERN OVERALL STRUCTURE

Below is a diagram of the overall pattern structure:



4.3 PATTERN SELECTION

The Avalon has (112) internal patterns. Patterns are organized into (7) banks with (16) patterns within each bank. The (16) patterns of each bank are further organized into two groups of eight.



4.3.1 PATTERN BANK

First, select one of seven pattern banks with the **PATT. BANK** selector.

4.3.2 PATTERN GROUP

Second, select Group A or Group B with the **GROUP A-B** buttons.

4.3.3 PATTERN NUMBER

Lastly, select a pattern number using the **PATTERN BUTTONS 1 - 8**.

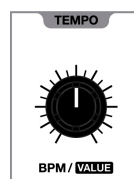
4.4 PATTERN PLAYBACK

To play back a pattern using internal sync Press **RUN** while in **PATTERN PLAY** or **PATTERN WRITE** MODE. Set the **TEMPO** control so that you can see the step indicators running across the sixteen steps. The **RUN** indicator is lit when the sequencer is running.

For information on sequencer sync options, including how to slave the Avalon to DINSync or MIDI please see section 10.1.

4.4.1 TEMPO

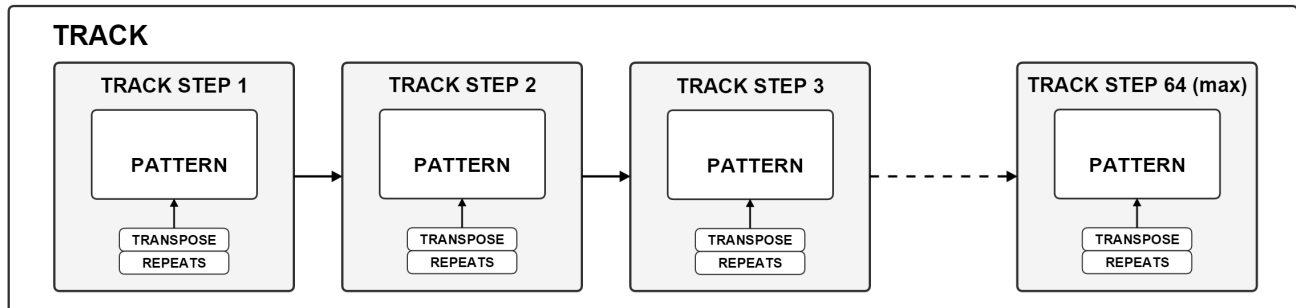
Set the tempo using the **TEMPO** control. The tempo ranges from 40 - 300BPM.



4.5 WHAT IS A TRACK?

A TRACK is a sequence of PATTERNS. TRACKS are used to compose entire songs from one or more patterns.

Each TRACK is made up of a series of TRACK STEPS. A TRACK can contain up to (64) individual TRACK STEPS. Each TRACK STEP can have it's own transpose value and number of repeats.



4.6 TRACK SELECTION

The Avalon has (7) internal tracks. Tracks are selected using the rotary switch and are denoted by the roman numerals I through VII. Tracks are made up of pattern within the pattern bank that corresponds to the track number. For example, TRACK IV uses patterns that reside in PATTERN BANK 4.



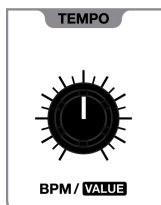
4.7 TRACK PLAYBACK

To play back a track using internal sync Press **RUN** while in TRACK PLAY or TRACK WRITE MODE. Set the **TEMPO** control so that you can see the step indicators running across the sixteen steps. The **RUN** indicator is lit when the sequencer is running.

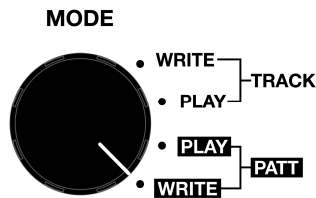
For information on sequencer sync options, including how to slave the Avalon to DINSync or MIDI please see section 10.1.

TEMPO

Set the tempo using the **TEMPO** control. The tempo ranges from 40 - 300BPM.



5 PATTERN WRITE MODE

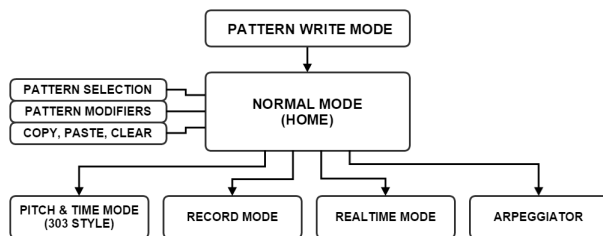


PATTERN WRITE MODE is where patterns are composed & edited. Pattern and Track modes can be changed and all programming can be done realtime while the sequencer is running.

For details on PATTERN SELECTION please see section 4.3.

5.1 OVERVIEW

Within PATTERN WRITE MODE there are several (sub) modes for editing pattern data. Below is a diagram of the basic workflow of PATTERN WRITE MODE:



NORMAL MODE is the main mode for entering pattern data. It is also the "HOME" state of the sequencer in PATTERN WRITE MODE.

RECORD MODE is for recording the pattern in realtime by *playing* the control surface or external MIDI/USB-MIDI device.

PITCH & TIME (STEP ENTRY) MODE is based on the TB-303 style of entering pattern data.

REALTIME MODE is used to add or mute accent, slide and/or modulation envelope triggers in realtime without overwriting pattern data.

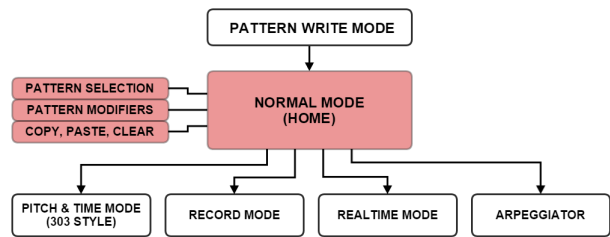
ARPEGGIATOR is used for playing arpeggios. Arpeggios can also be recorded realtime directly into a pattern.

The various editing modes are not exclusive of each other, you can go back and forth between them to modify pattern data.

i A NOTE ON SAVING TO MEMORY

The memory contents of a pattern bank are stored temporarily in RAM, so any changes to patterns are automatically stored in RAM to allow the sequencer to playback in all main modes without being interrupted. In this regard there is no explicit save function for patterns, and workflow is not interrupted. Whenever the sequencer is stopped, or the Pattern Bank or Track is changed, the scratchpad RAM contents are stored to permanent memory.

5.2 NORMAL MODE



NORMAL MODE is the most direct and comprehensive method for entering pattern data. It is the default "HOME" state of PATTERN WRITE MODE. NORMAL MODE is indicated by a solid lit indicator above the **HOME** button.



5.2.1 PATTERN CLEAR, COPY & PASTE

To clear a pattern press **[FUNCTION] + [CLEAR]** and the current pattern will be cleared.



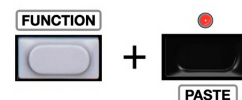
The default settings for a pattern are shown below:

- Time Signature = 1x (one step is 1/16 note)
- Pattern Length = 16 steps
- All steps = ACTIVE
- All steps = REST
- All steps = PITCH C2 (65.4Hz)
- SLIDE TIME = 100mS for all steps
- FILTER CV offset = 0
- GATE TIME = 50% for all steps
- SHUFFLE = 1 (off)
- No transpositions, accents, slides, or mod env triggers

To copy a pattern press **[FUNCTION] + [COPY]**. The current pattern will be copied to the pattern buffer.



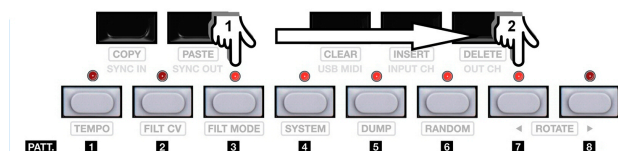
To paste to a new location select a new pattern and press **[FUNCTION] + [PASTE]**.



i Patterns can also be copied between banks by selecting a new bank before pasting.

5.2.2 PATTERN CHAINING

A group of patterns within the current PATTERN GROUP can be chained. A pattern chain will loop continuously until a different pattern or a new pattern chain is selected. To create a pattern chain select the first pattern in the chain followed by the last pattern in the chain. The LED indicators of the patterns within the chain will remain lit to show the chain. The LED indicator of the currently playing pattern will blink.



5.2.3 PATTERN MODIFIERS

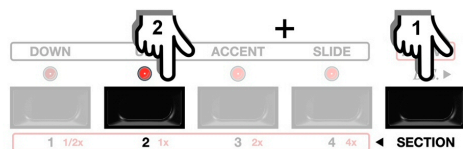
Pattern modifiers are the global settings for each pattern, such as the time signature, pattern length, and shuffle amount. Pattern modifiers can only be performed in NORMAL MODE.

- 1) Pattern Length
- 2) Last Step
- 3) Time Signature
- 4) Shuffle
- 5) Pattern Direction
- 6) Pattern Rotate
- 7) Pattern Randomize
- 8) Pattern Transpose
- 9) Filter Mode

5.2.3.1 PATTERN LENGTH

Patterns can be up to (64) steps long. They are divided into four SECTIONS of (16) steps.

Sections are selected by pressing **SECTION + BUTTON 1-4**. When the current section is changed the control surface shifts to display and control the parameters for the newly selected section. For example, to select SECTION 2 (if the pattern is less than or equal to 16 steps there may not yet be any active data in the section).



5.2.3.2 LAST STEP

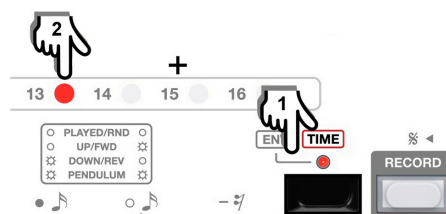
Before changing pattern lengths and entering step attributes it is important to understand LAST STEP.

LAST STEP sets the last step of a pattern so that the sequencer knows when to loop. To set the last step for a pattern first select the SECTION of the desired last step as described in section 5.2.3.1. Once viewing the desired section press **[TIME] + STEP BUTTON** of the desired last step.

For example, to set the last step as step 29 of a sequence you would do as follows:

a) Select SECTION 2 by pressing **SECTION + BUTTON 2** as shown in section 5.2.3.1.

b) Select the last step within SECTION 2 (step 29) by pressing **[TIME] + STEP BUTTON 13**. The indicator will light solid.



Now the pattern will cycle through two sections (29 steps total assuming all steps are set to be active steps). When pressing and holding the **[TIME]** button the last step will show on the **STEP BUTTON** indicators.

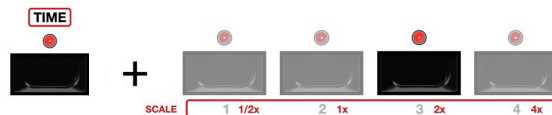
i Pitch & Time data can be entered for sections beyond the section that includes the last step. This allows for realtime manipulation.

5.2.3.3 TIME SIGNATURE

Patterns can be assigned one of (8) time signatures.

- 1/2x: each step = 1/32 note
- 1x: each step = 1/16 note (default)
- 2x: each step = 1/8 note
- 4x: each step = 1/4 note
- 1/2x triplet: each step = 1/32 note triplet
- 1x triplet: each step = 1/16 note triplet
- 2x triplet: each step = 1/8 note triplet
- 4x triplet: each step = 1/4 note triplet

The scale is set using the scale buttons. To change the scale the press **[TIME] + [1/2x]/[1x]/[2x]/[4x]**. For example, to select the 2x scale press **[TIME] + [2x]**.



To select the triplet variation of a scale double-click the corresponding button.

Whenever the **[TIME]** button is pressed and held the current timing scale of the pattern displays on the scale buttons indicators. When in a triplet scale the indicator blinks.

i When in triplet modes a pattern must be a triplet division. When switching scales between a duple and triplet, the last step is automatically changed to a triplet division to keep the pattern in sync. For example, switching from 1x time scale to 1x (triplet) on a 16 step pattern will automatically change the last step to step 12.

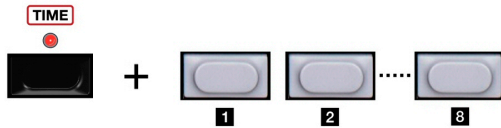
tip Changing the scale will not take effect until the pattern loops so the pattern stays in sync.

5.2.3.4 SHUFFLE

Shuffle is available for all dupe meters. The amount of available shuffle depends on the selected scale as shown below. The shuffle setting is saved with each pattern.

- 1/2x - 4 levels of shuffle
- 1x - 6 levels of shuffle
- 2x - 8 levels of shuffle
- 4x - 8 levels of shuffle

The shuffle amount is set and displayed using the **PATTERN BUTTONS** and corresponding indicators. To view the current shuffle setting press & hold **[TIME]**. While the button is held the shuffle amount is indicated on the pattern button indicators. The higher the number the greater the shuffle amount. To set the amount of shuffle press **[TIME]** + **PATTERN BUTTON 1 - 8**.

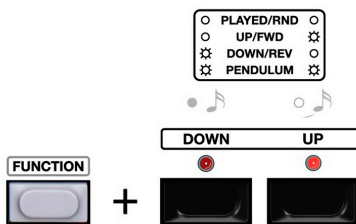


i A setting of "1" indicates no shuffle.

tip Changes in shuffle amount do not take effect until the pattern loops.

5.2.3.5 PATTERN DIRECTION

There are (4) options for pattern direction. The direction is set and displayed using the **[FUNCTION]** & **[UP]/[DOWN]** buttons.



- **RANDOM.** When the **[UP]** & **[DOWN]** indicators are both *unlit* the pattern steps are played in a random repeating pattern.
- **FORWARD.** When the **[UP]** indicator is lit the pattern is played forwards.
- **REVERSE.** When the **[DOWN]** indicator is lit the pattern is played in reverse.
- **PENDULUM.** When both the **[UP]** & **[DOWN]** indicators are lit the pattern is played forwards & then backwards.

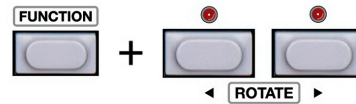
The graphic above the buttons shows the indicator combination for each option so it doesn't have to be memorized.

To change the pattern direction press **[FUNCTION]** + **[UP]/[DOWN]** and select the desired option.

i Pendulum modes repeats the last step so that the pattern remains at the same time division.

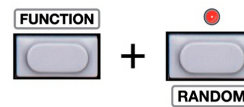
5.2.3.6 PATTERN ROTATE

Pattern steps can be rotated forwards and backwards using the **[FUNCTION]** & **[ROTATE]** buttons. For example, to rotate the pattern data forwards one step press **[FUNCTION]** + **[ROTATE ▶]**.



5.2.3.7 PATTERN RANDOMIZE

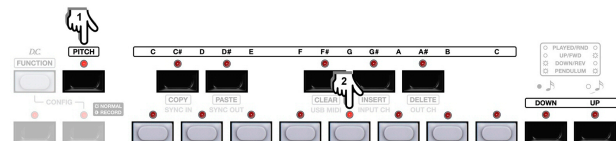
Randomizing a pattern overwrites all pitch & time parameters with random data. Once a pattern is randomized the original data is lost. To randomize a pattern press **[FUNCTION]** + **[RANDOM]**.



tip **PATTERN RANDOMIZE** is different than pattern random direction as described in section 5.2.3.5. 'Randomize' randomizes all pattern data. The 'Random' pattern direction simply plays the pattern steps in random order.

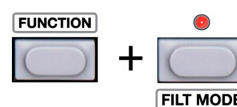
5.2.3.8 PATTERN TRANSPOSE

Patterns can be globally transposed in semitones and octaves. To transpose a pattern press the **[PITCH]** and the octave **[UP]/[DOWN]** buttons and/or **[BUTTON KEYS]** to enter the transpose amount. The transpose amount is relative to **[BUTTON KEY C]**, where C corresponds to the root pattern (no transpose). For example, to transpose a pattern by a 5th (seven semitones) press **[PITCH]** + **[BUTTON KEY G]**.



5.2.3.9 FILTER B MODE

The **[FILT MODE]** button is for selecting between filter modes for an external filter cartridge. Filter cartridges are referred to as FILTER B as they are a secondary plugin filter option. All filter carts support two filter modes, and the mode is saved with each pattern. Mode "1" is selected when the **[FILT MODE LED]** is *unlit*. Mode "2" is selected when the **[FILT MODE LED]** is lit. Details on FILTER B MODES are specific to each filter cartridge.



5.2.4 PITCH ATTRIBUTES

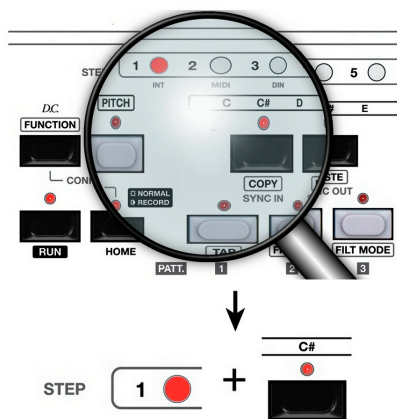
There are several pitch-related parameters for each pattern step. These include the following:

- 1) Pitch
- 2) Accent & Slide
- 3) Transpose
- 4) Modulation Envelope Triggers
- 5) Slide Time
- 6) Filter CV Offset
- 7) Gate Length

These attributes can all be set while the sequencer is running.

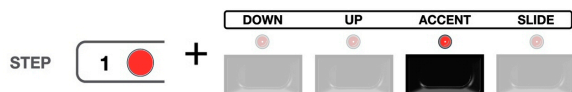
5.2.4.1 PITCH

To enter a pitch, press and hold a step button and select a key on the chromatic keyboard. For example, to enter a "C#" on step 1 press **STEP BUTTON 1 + [BUTTON KEY C#]**. The C# indicator will remain lit while the step button is held to indicate C# has been programmed.



5.2.4.2 ACCENT & SLIDE

Accent and Slide are entered in the same way as pitch. Press and hold a **STEP BUTTON** and press **[ACCENT]** and/or **[SLIDE]** to enter the respective data. For example, to accent step 1 press **STEP BUTTON 1 + [ACCENT]**. The accent indicator will remain lit while the step button is held to indicate an accent has been programmed.



5.2.4.3 TRANSPOSE

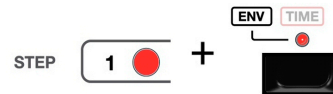
Since the chromatic keyboard is only one octave a step can be transposed down one octave and up one or two octaves. When transposing *down* the **[DOWN LED]** is lit. When transposing *up* one octave the **[UP LED]** is lit. When transposing *up* two octaves the **[UP LED]** blinks.



i The keyboard has two "C" keys. The low C key can be transposed [UP] (3) octaves as the note will first shift to the higher C' key.

5.2.4.4 MODULATION ENVELOPE TRIGGERS

The Avalon has an extra modulation envelope that can be triggered on any step in a similar way to accents and slides. To trigger the modulation envelope press **STEP BUTTON + [ENV]**. For example, to add a trigger to step 1 press **STEP BUTTON 1 + [ENV]**.

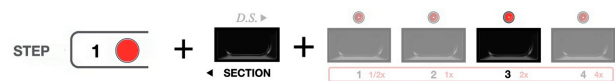


5.2.4.5 SLIDE TIME

The Avalon allows each note event to have a different slide time. To set the slide time for a note event press **STEP BUTTON + SECTION + BUTTON 1-4**.

- TIME 1 = 30mS
- TIME 2 = 100mS (default 303)
- TIME 3 = 250mS
- TIME 4 = 1s

For example, to set a slide time of 250mS on step 1 press **STEP BUTTON 1 + SECTION + 3**.

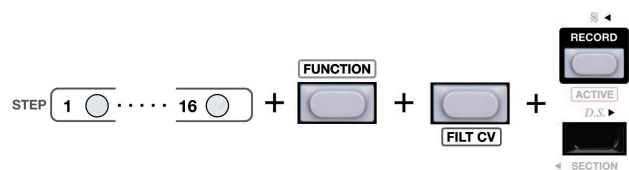


i Slide Time is a time attribute in the traditional sense, however it is listed as a pitch attribute as it is entered as a pitch/note event.

5.2.4.6 FILTER CV OFFSET

The Avalon allows for a Filter CV Offset to be set for each step. This will open or close the filter by the offset value for the duration of the step. There are a total of 128 values (-64 to +63) covering a (4) octave range. By default the offset is set to "0" for all steps. The offset is set using the **STEP BUTTONS**, **[FUNCTION]**, **[FILT CV]**, **NEXT ▶** & **BACK ◀** buttons as described below:

- 1) Press and hold **STEP BUTTON + [FUNCTION] + [FILT CV]**
- 2) While holding the buttons above use **NEXT ▶** & **BACK ◀** to increase & decrease the offset.



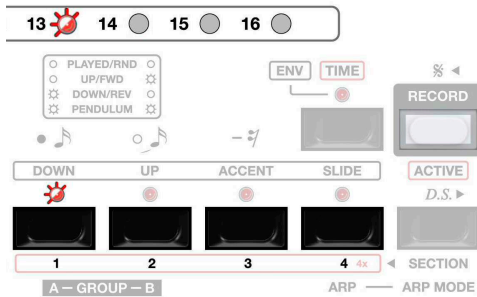
- 3) The offset value is indicated on the **STEP BUTTON LED's**, **BUTTON 1-4 LED's**, and the **[FILT CV LED]**.

The **BUTTON 1-4 LED's** signify the offset value groups.

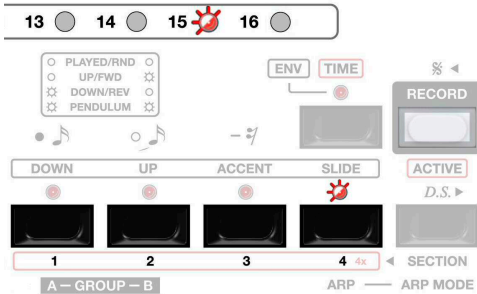
- **BUTTON 1 LED** = values 1-16
- **BUTTON 2 LED** = values 17-32
- **BUTTON 3 LED** = values 33-48
- **BUTTON 4 LED** = values 49-64

The **STEP BUTTON LED's** signify the values (1-16) within the current value group. In this way, $4 \times 16 = (64)$ values can be displayed using these indicators.

For example, below indicates a value of 13:



...and below indicates a value of 63:



4) The offset polarity is indicated on the **[FILT CV LED]**.

- Zero "0" offset is indicated when **[FILT CV LED]** is unlit.
- Positive offset is indicated when **[FILT CV LED]** is lit solid.
- Negative offset is indicated when **[FILT CV LED]** blinks.

5.2.4.7 GATE LENGTH

The Avalon allows for (4) different gate lengths per step. Gate lengths are shown as a percentage of the step length. The default gate length is 50% (same as the TB-303). The available gate lengths are 10%, 30%, 50% and 90%.

- **BUTTON 1** = 10%
- **BUTTON 2** = 30%
- **BUTTON 3** = 50% (default 303)
- **BUTTON 4** = 90%

To set the gate length for a step press **STEP BUTTON** + **[FUNCTION]** + **BUTTON 1-4**.

For example, to set a gate time of 50% on step 1 press **STEP BUTTON 1** + **[FUNCTION]** + **BUTTON 3**:



5.2.5 TIME ATTRIBUTES

There are also time-related parameters for each pattern step:

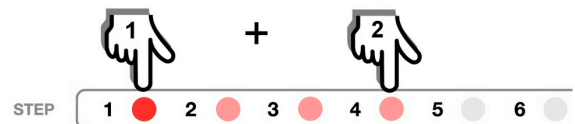
- 1) Note Event
- 2) Tie / Rest
- 3) Active Steps

5.2.5.1 NOTE EVENTS

Note events are added to a sequence simply by pressing the **STEP BUTTONS**. When a note has been added to a step the **STEP BUTTON LED** will light up. This indicates that the step is active and a note is entered. If you press the same **STEP BUTTON** again the indicator will go out and the step is set as a REST.

5.2.5.2 NOTE LENGTH, TIES & RESTS

To set a note length greater than one step press & hold the first step of the note and then press the last step of the note. Now it is one long step with ties automatically programmed for the intermediate steps. For example, to make steps 1-4 one long note (this would be a quarter-note at the default 1x scale) you would press **STEP BUTTON 1** + **STEP BUTTON 4**. Steps that are tied are easily seen as the indicators will be *half-brightness*.



Steps that don't have a note or tie programmed are RESTS and are indicated by unlit **STEP BUTTON LED's**.

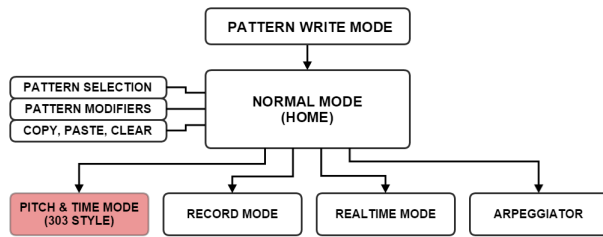
5.2.5.3 ACTIVE STEPS

Steps in a pattern can be skipped by pressing **[TIME]** + **[ACTIVE]** + **STEP BUTTON**. While holding down **[TIME]** + **[ACTIVE]** you can easily see which steps are inactive in a pattern section, as steps that are not active are not lit. De-activating steps will inherently change the pattern length.

For example, to set step 16 as an active step hold **[TIME]** + **[ACTIVE]** and press **STEP BUTTON 16** until it is lit.



5.3 PITCH & TIME STEP ENTRY MODES



The Avalon can also be programmed like the TB-303 where pitch and time information are entered separately. There are also enhancements to the TB-303 method.

5.3.1 PITCH STEP ENTRY

Double click **[PITCH]** to enter pitch entry mode. The **[PITCH LED]** lights up and the Avalon is ready to accept note events in a step entry fashion.

To enter note events (pitches) press the keys on the chromatic keyboard. When a pitch is entered the sequencer will automatically advance to the next step. The current step awaiting note entry is indicated by the blinking **STEP BUTTON LED**.

To skip a step forwards or backwards use the **NEXT ▶** and **◀ BACK** buttons:



The sequencer will automatically exit to NORMAL MODE once the pitch attributes for the LAST STEP have been entered. If you want to exit PITCH ENTRY MODE before the last step of the sequence simply press **HOME** to go back to NORMAL MODE.

Tip If the pattern uses more than one section the current section view will automatically increment when the current step gets to the next section.

5.3.2 TIME STEP ENTRY

Double click **[TIME]** to enter time entry mode. The **[TIME LED]** lights up and the Avalon is ready to accept time events in a step entry fashion.

To enter time attributes use the **NOTE, TIE, & REST BUTTONS**.



When a note, tie, or rest is entered the sequencer will automatically advance to the next step. The current step awaiting time data entry is indicated by the blinking **STEP BUTTON LED**.

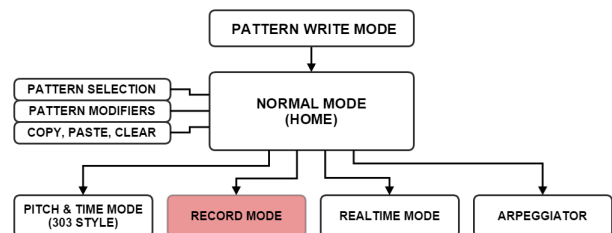
To skip a step forwards or backwards use the **NEXT ▶** and **◀ BACK** buttons.

The sequencer will automatically exit to NORMAL MODE once the time attributes for the LAST STEP have been entered. If you want to exit PITCH ENTRY MODE before the last step of the sequence simply press **HOME** to go back to NORMAL MODE.

i If it is desired to use **TIME STEP ENTRY MODE** as the exclusive mode for entering time information the pattern length (last step) still must be set as described in section 5.2.3.1.

i Avalon uses 16th note, tie and rest symbols even though the step length (time division) may be different if not using the default 1x time signature. A step may correspond to a 32nd (1/2x scale), an eight, (2x scale), or a quarter (4x scale). The notation is a salute to the original TB-303 control surface.

5.4 RECORD MODE



Record mode is useful for recording pattern data realtime by *playing* the chromatic keyboard or an external MIDI device.

5.4.1 ENTER & EXIT RECORD MODE

To enter RECORD MODE simply press **RECORD**. The **HOME LED** will blink to indicate that you are in RECORD MODE.



If the sequencer is stopped press **RUN** to start it. To exit RECORD MODE press **HOME** to return to NORMAL MODE.

5.4.2 RECORDING REALTIME PERFORMANCE

There are several step attributes that can be recorded realtime:

- 1) Record Notes
- 2) Record Transpose
- 3) Record Accent & Slide
- 4) Record Modulation Envelope Triggers
- 5) Record Slide Time
- 6) Record Filter CV Offset

5.4.2.1 RECORD NOTES

As the sequencer is running simply play notes on the Avalon or from an external MIDI device. If you hold a key down for multiple steps it will program the note length automatically.

5.4.2.2 RECORD TRANPOSE

To record realtime TRANPOSE press **[PITCH] + [UP]/[DOWN]**. For example to transpose a step, series of steps, or an entire pattern *down* one octave press and hold **[PITCH] + [DOWN]** in realtime.



5.4.2.3 RECORD ACCENT & SLIDE

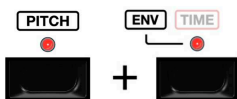
To record realtime ACCENT & SLIDE press **[PITCH] + [ACCENT]/[SLIDE]**. For example, to record accents to a step or series of steps press and hold **[PITCH] + [ACCENT]** in realtime.



If recording from an external MIDI device ACCENTS will be programmed for notes with a NOTE ON velocity higher than MIDI value 63. SLIDES are programmed when notes are played legato (overlapping).

5.4.2.4 RECORD MOD ENV

To record realtime MOD ENV triggers press **[PITCH] + [ENV]** whenever you would like to add a trigger to a step or series of steps.

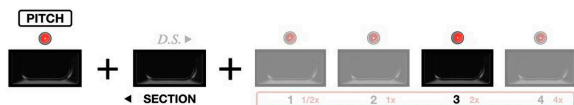


If recording realtime from an external MIDI device MOD ENV triggers can be recorded by sending MIDI CC#80 with a value higher than 63.

5.4.2.5 RECORD SLIDE TIME

You can also record realtime SLIDE TIME by pressing **[PITCH] + SECTION + BUTTON 1-4**. BUTTONS 1-4 select the four available slide times.

- TIME 1 = 30mS
- TIME 2 = 100mS (default 303)
- TIME 3 = 250mS
- TIME 4 = 1s

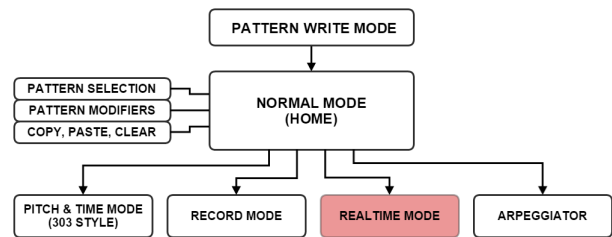


5.4.2.6 RECORD FILTER CV OFFSET

FILT CV offsets can be recorded from an external MIDI device by pressing and holding **[FUNCTION] + [FILT CV]** while sending the Avalon MIDI CC#74 messages from an external device. The incoming MIDI data will be sampled and the value set for each step.

i Filter cutoff data (MIDI CC#74) is also received by the Avalon outside of RECORD MODE for traditional cutoff control (not a per-step parameter lock).

5.5 REALTIME MODE



Realtime Mode is used for adding or muting accent, slide and/or modulation envelope triggers in realtime without overwriting the pattern data. If you want to edit the data permanently use Record Mode as described in section 5.4.

5.5.1 REALTIME ACCENT & SLIDE

Accent and Slide can be *played* to trigger accents and slides.

To override pattern step data with accents and/or slides, press **[PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to accent steps press and hold **[PITCH] + [ACCENT]**.



Accent and Slide can also be *played* to mute accents and slides.

To override pattern step data and mute accents and/or slides, press **[FUNCTION] + [PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to mute accents press and hold **[FUNCTION] + [PITCH] + [ACCENT]**.



5.5.2 REALTIME MOD ENV

The modulation envelope can be triggered in realtime by pressing **[PITCH] + [ENV]**. Each time the button combination is pressed the modulation envelope will be triggered.

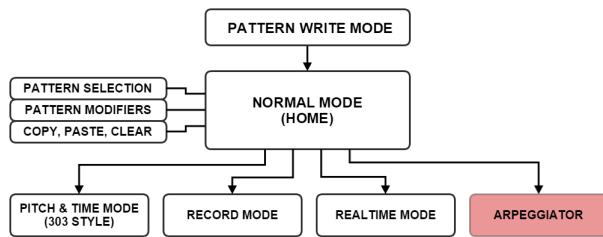


tip The modulation envelope can also be triggered with the sequencer stopped. This can be useful for drones with long evolving filter and/or VCA modulation.

To mute modulation envelope triggers to prevent it from being triggered press and hold **[FUNCTION] + [PITCH] + [ENV]**.



5.6 ARPEGGIATOR



The Avalon includes an arpeggiator with multiple modes and a realtime record option.

5.6.1 ARP ON/OFF

To turn on the arpeggiator press **ARP**. When the arpeggiator is active the **ARP LED** blinks.



To exit the arpeggiator press **HOME** to return to NORMAL MODE. When back in NORMAL MODE the **ARP LED** will stop blinking and the **NORMAL LED** will be lit solid to indicate the sequencer is back in NORMAL MODE.

5.6.2 NOTE ENTRY

To enter notes for the arpeggio simply enter notes on the chromatic keyboard or via an external MIDI device.

5.6.2.1 VIA AVALON KEYBOARD

The method for entering notes for an arpeggio from the control surface is *consecutive note input*. This means notes are entered one at a time. For example, to enter a C-major chord comprised of notes C-E-G you would press and release **[BUTTON KEY C]**, then press and release **[BUTTON KEY E]**, and then press and release **[BUTTON KEY G]**. If notes are pressed simultaneously the results are not predictable as a result of a design limitation imposed by the TB-303 compatible keyboard input matrix.

5.6.2.2 VIA EXTERNAL MIDI

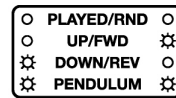
To enter notes for an arpeggio from an external MIDI device make sure the MIDI input channel is set (see section 10.1.2). The arpeggio can be played across the entire range that the Avalon responds to (F#0 to D#5). The notes for the arpeggio must be held, they are not latched as they are when entering notes from the Avalon control surface.

5.6.3 ARP MODE

There are four arpeggiator modes:

- Up
- Down
- Up/Down
- Played

The mode is entered using the **ARP MODE** and **[UP]/[DOWN]** buttons in a similar way as pattern direction. The two buttons and their corresponding indicators allow for four states as indicated on the graphic:



- 1) To select UP mode press **ARP MODE + [UP]** (the UP LED will be lit).
- 2) To select DOWN mode press **ARP MODE + [DOWN]** (the DOWN LED will lit).
- 3) To select UP/DOWN mode press **ARP MODE + [DOWN] + [UP]** (the DOWN & UP LED's will be lit).
- 4) To select PLAYED mode press **ARP MODE + [DOWN]/[UP]** until both the **[DOWN LED]** & **[UP LED]** are *not* lit.

In PLAYED mode the notes in the arpeggio are played in the order they are entered on the Avalon keyboard or played via MIDI.

5.6.4 REALTIME ACCENT, SLIDE, & MOD ENV

Accents, slides, and modulation envelope triggers can be played realtime while the arpeggiator is running by pressing **[ACCENT]**, **[SLIDE]** and/or **[ENV]**.

5.6.5 ARP RECORD

If you like an arpeggio and want to record it directly into the current pattern simply press and hold **RECORD**. While the button is pressed and held, the arpeggio data is recorded into the pattern in realtime.

You can also record realtime accent, slide, and modulation envelope triggers into the pattern by holding the **RECORD** button while entering realtime accent, slide, & mod env as described above in section 5.6.4.

5.7 PATTERN SYSEX DUMP

The pattern data of the pattern copy buffer can be dumped over MIDI as system exclusive information. This allows patterns to be backed up to a computer for storage. Pattern dumps can be sent and received while the sequencer is running.

5.7.1 TRANSMIT

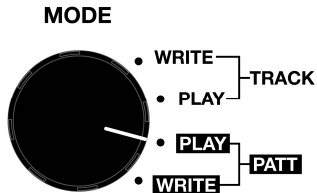
To transmit a specific pattern, it should first be copied to the pattern copy buffer using the track copy function as described in section 5.2.1. Once the pattern is copied make sure the receiving MIDI device is setup to listen for the SYSEX dump. Press **[FUNCTION] + [DUMP]** to initiate the dump.



5.7.2 RECEIVE

Once the external MIDI device is setup press **[FUNCTION] + [DUMP]** to initiate the dump. When a SYSEX pattern dump is received over MIDI it is placed into the pattern copy buffer and must be pasted into a destination pattern location as described in section 5.2.1.

6 PATTERN PLAY MODE

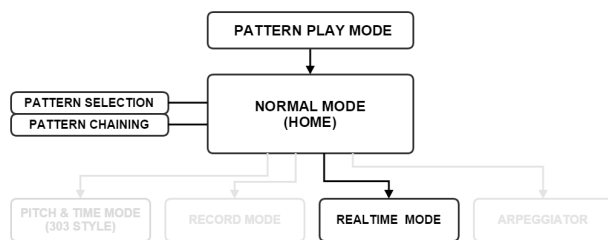


PATTERN PLAY mode is used for playing back existing patterns. It is useful for performance playback as it allows for realtime changes of some pitch and time parameters without the ability to destructively edit step attributes.

PATTERN SELECTION is described in section 4.3.

6.1 OVERVIEW

Within PATTERN PLAY MODE there are two (sub) modes for editing pattern data. Below is a simple graphical representation of the basic workflow of PATTERN WRITE MODE:

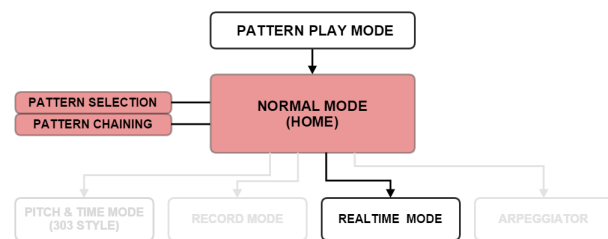


NORMAL MODE is the main mode for entering pattern data. It is also the "HOME" state of the sequencer in PATTERN PLAY MODE.

REALTIME MODE is used for overriding pattern step attributes realtime.

All editing in PATTERN PLAY MODE can be performed with the sequencer running.

6.2 NORMAL MODE



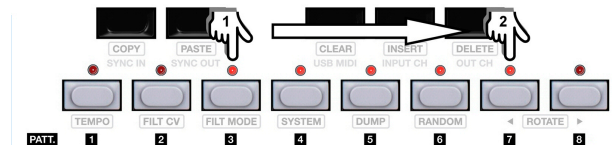
NORMAL MODE is where patterns and pattern chains are selected. NORMAL MODE is indicated by a solid lit indicator above the **HOME** button.

6.2.1 PATTERN SELECTION

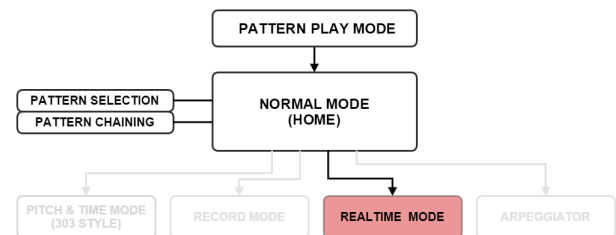
Patterns are selected using the **PATTERN BUTTONS & GROUP A/B BUTTONS** as described in section 4.3.

6.2.2 PATTERN CHAINING

A group of patterns within the current pattern group can be chained. A pattern chain will loop continuously until a different pattern or new pattern chain is selected. To create a pattern chain select the first pattern in the chain followed by the last pattern in the chain. The LED indicators of the patterns within the chain will remain lit to show the chain. The LED indicator of the currently playing pattern will blink.



6.3 REALTIME MODE

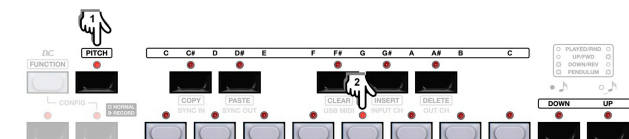


There are several pattern attributes that can be performed realtime to override the pattern settings.

- 1) Transpose
- 2) Accent & Slide
- 3) Mod Env Triggers
- 4) Pattern Rest (Mute)

6.3.1 TRANSPOSE

Patterns can be transposed in semitones and octaves. To transpose realtime press the **[PITCH]** and the octave **[UP]/[DOWN]** buttons and/or **[BUTTON KEYS]** to enter the transpose amount. The transpose amount is relative to **[BUTTON KEY C]**, where C corresponds to the root pattern (no transpose). For example, to transpose a pattern by a 5th (seven semitones) press **[PITCH] + [BUTTON KEY G]**.



i Pattern Transpose settings in PATTERN PLAY MODE are saved. This is the only parameter that can be edited/saved in PATTERN PLAY MODE.

6.3.2 REALTIME ACCENT & SLIDE

Accent and Slide can be *played* to trigger accents and slides.

To override pattern step data with accents and/or slides, press **[PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to accent steps press and hold **[PITCH] + [ACCENT]**.



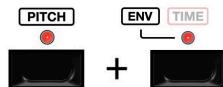
Accent and Slide can also be *played* realtime to mute accents and slides.

To override pattern step data and mute accents and/or slides, press **[FUNCTION] + [PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to mute accents press and hold **[FUNCTION] + [PITCH] + [ACCENT]**.



6.3.3 REALTIME MOD ENV

The modulation envelope can be triggered in realtime by pressing **[PITCH] + [ENV]**. Each time the button combination is pressed the modulation envelope will be triggered.



tip The modulation envelope can also be triggered with the sequencer stopped. This can be useful for drones with long evolving filter and/or VCA modulation.

To mute modulation envelope triggers to prevent it from being triggered press **[FUNCTION] + [PITCH] + [ENV]**.

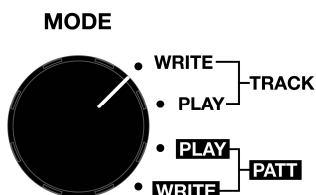


6.3.4 REALTIME MUTE

Rests can be played realtime to override the pattern time data. This selectively mutes the pattern. This is done by pressing **REST 7**.

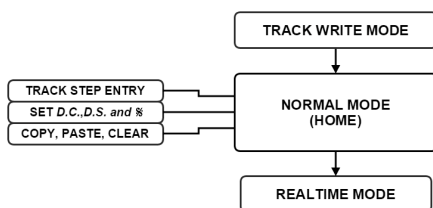


7 TRACK WRITE MODE



7.1 OVERVIEW

Within TRACK WRITE MODE there are two (sub) modes for editing track data. Below is a simple graphical representation of the basic workflow of TRACK WRITE MODE:



NORMAL MODE is the main mode for entering track data. It is also the "HOME" state of the sequencer in TRACK WRITE MODE.

REALTIME MODE is used for overriding track step attributes in realtime.

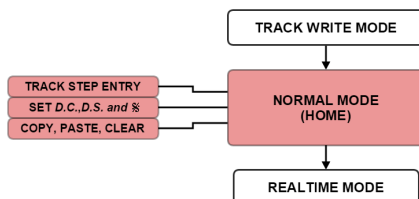
All editing in TRACK WRITE MODE can be performed with the sequencer running.

7.2 SELECTING TRACKS

Select one of the (7) TRACKS to write to using the **TRACK / PATT. BANK** selector.



7.3 NORMAL MODE



NORMAL MODE is where TRACKS STEPS are programmed. It is the default "HOME" state of TRACK WRITE MODE. NORMAL MODE is indicated by a solid lit indicator above the **HOME** button.

7.3.1 TRACK STEP INDICATORS

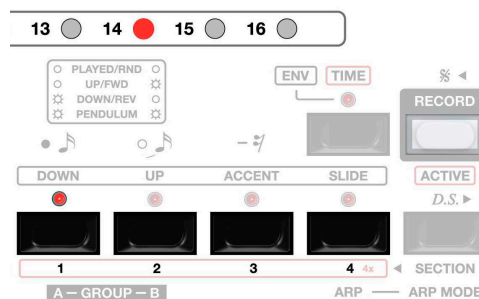
The current TRACK STEP is indicated on the **STEP BUTTONS & BUTTON 1-4 LED's**. The indicators light solid to show the current TRACK STEP whenever the **NEXT ▶** or **◀ BACK** button is held down. They are arranged as (4) groups of (16) track steps.

The **BUTTON 1-4 LED's** signify the TRACK STEP group.

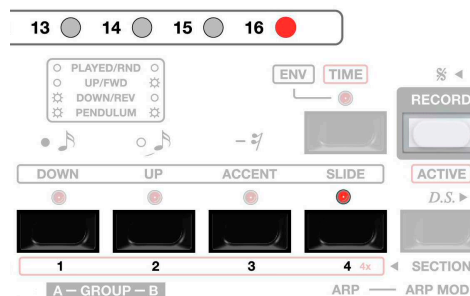
- **BUTTON 1 LED** = 1st group of 16 track steps (steps 1-16)
- **BUTTON 2 LED** = 2nd group of 16 track steps (steps 17-32)
- **BUTTON 3 LED** = 3rd group of 16 track steps (steps 33-48)
- **BUTTON 4 LED** = 4th group of 16 track steps (steps 49-64)

The **STEP BUTTON LED's** signify the track steps (1-16) within the current group.

For example, below indicates TRACK STEP 14:



...and below indicates TRACK STEP 64:



7.3.2 LAST TRACK STEP

The last TRACK STEP is indicated by the **TIME LED** being lit solid when the **NEXT ▶** or **◀ BACK** button is held down:



7.3.3 TRACK CLEAR, COPY & PASTE

To clear the current selected track press **[FUNCTION]** + **[CLEAR]**.



This sets each track step to PATTERN 1 of the corresponding bank, with no transpositions, one repeat per track step, and a track length of (64) steps.

A track can be copied from one location to another. To copy a track select the first track with the selector.



Press **[FUNCTION]** + **[COPY]** to copy the current track to temporary memory.



Next, select the track to paste to. For example, TRACK VII:



Next press **[FUNCTION]** + **[PASTE]** to paste to TRACK VII.



7.3.4 WRITING A TRACK

A track can be written with the sequencer running. To begin a new TRACK press **HOME** to set the sequence to NORMAL MODE and reset the track to TRACK STEP 1.



i Pressing **HOME** will always return the track to TRACK STEP 1.

7.3.4.1 SELECT PATTERN

To write the first TRACK STEP select a pattern from one of the two pattern groups available for the current track. Pattern selection is described in section 4.3.

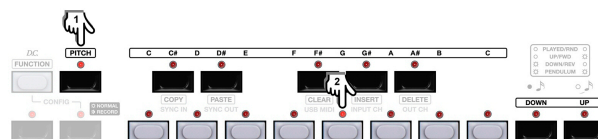
7.3.4.2 TRANSPOSE

Track steps can be transposed by semitones and an octave up or down.

To transpose the current track step up or down one octave press **[PITCH]** + **[UP]/[DOWN]**. When the transpose is selected the corresponding LED indicator will light up while the **[PITCH]** button is held.



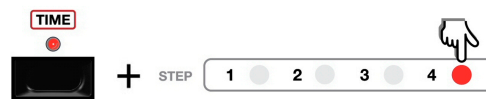
To transpose a track step by semitones press the **[PITCH]** and one of the **[BUTTON KEYS]** to enter the transpose amount. The transpose amount is relative to **[BUTTON KEY C]**, where C corresponds to the root pattern (no transpose). For example, to transpose a pattern by a 5th (seven semitones) press **[PITCH]** + **[BUTTON KEY G]**.



i Track step transpose settings are not saved with patterns, so a single pattern can be used with different track step transpose settings to create a musical sequencer from a single pattern.

7.3.4.3 ADD REPEATS

To add repeats press **[TIME]** + **STEP BUTTON 1-16**. For example, to add (4) repeats to the current track step press **[TIME]** + **STEP BUTTON 4**.



7.3.4.4 PREVIOUS & NEXT STEP

Track steps are not advanced automatically. Once finished selecting the pattern, repeats, and transpose settings for a track step use the **◀ BACK** and **NEXT ▶** buttons to proceed to the previous or next step.



7.3.4.5 LAST STEP

To set the last track step press **D.C.** + **[TIME]**.



When the last track step is set, the **[TIME LED]** will light when the last step is reached. For example, if the last track step is track step 16 the **[TIME LED]** will light when the **NEXT ►** or **◄ BACK** button is pressed and held on track step 16.

7.3.4.6 INSERT & DELETE

To insert a track step press **[FUNCTION]** + **[INSERT]**. A new track step will be inserted at the current location.



To delete a track step press **[FUNCTION]** + **[DELETE]**. The current track step will be deleted and the remaining track steps will move *back* one step.



7.3.4.7 SETTING D.S. AND %

The Avalon uses the musical notation *D.C.*, *D.S.*, and *%*. The use of notation saves panel space and is a salute to the original TB-303 control surface. *D.C.* means "from the top". This button is used to program the track step where you want to loop back to *track step 1*. Hence it is used to set the LAST TRACK STEP along with the TIME button. *%* is the "repeat from" sign, and *D.S.* means "from the sign". They are used to set cue points to loop a section of a track, so a track will loop from *D.S.* back to the *%* sign.

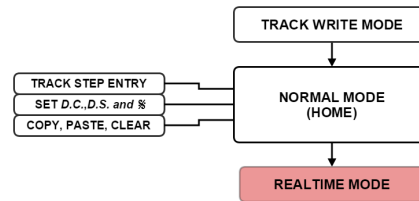
To set the *repeat from* sign on a track step press **[FUNCTION]** + **%**.



To set *D.S.* on a track step press **[FUNCTION]** + **D.S.**



7.4 REALTIME MODE



In REALTIME MODE track steps can be manipulated realtime by overriding transpose, accent, slide, and mod env. settings.

7.4.1 REALTIME ACCENT & SLIDE

Accent and Slide can be *played* to trigger accents and slides.

To override pattern step data with accents and/or slides, press **[PITCH]** + **[ACCENT]** / **[SLIDE]**. For example, to force a pattern to accent steps press and hold **[PITCH]** + **[ACCENT]**.



Accent and Slide can also be *played* realtime to mute accents and slides.

To override pattern step data and mute accents and/or slides, press **[FUNCTION]** + **[PITCH]** + **[ACCENT]** / **[SLIDE]**. For example, to force a pattern to mute accents press and hold **[FUNCTION]** + **[PITCH]** + **[ACCENT]**.



7.4.2 REALTIME MOD ENV

The modulation envelope can be triggered in realtime by pressing **[PITCH]** + **[ENV]**. Each time the button combination is pressed the modulation envelope will be triggered.

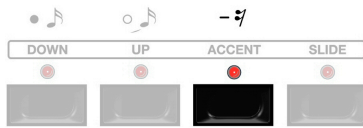


To mute modulation envelope triggers to prevent it from being triggered press **[FUNCTION]** + **[PITCH]** + **[ENV]**.



7.4.3 REALTIME MUTE

Rests can be played realtime to override the pattern time data. This selectively mutes the pattern. This is done by pressing **REST** 7/.



7.5 TRACK SYSEX DUMP

The track data of the track copy buffer can be dumped over MIDI as system exclusive information. This allows tracks to be backed up to a computer for storage. Track dumps can be sent and received while the sequencer is running.

7.5.1 TRANSMIT

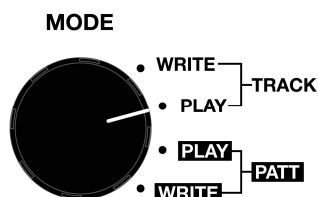
To transmit a specific track, it should first be copied to the track copy buffer using the track copy function as described in section 7.3.3. Once the track is copied make sure the receiving MIDI device is setup to listen for the SYSEX dump. Press **[FUNCTION] + [DUMP]** to initiate the dump.



7.5.2 RECEIVE

Once the external MIDI device is setup press **[FUNCTION] + [DUMP]** to initiate the dump. When a SYSEX track dump is received over MIDI it is placed into the track copy buffer and must be pasted into a destination track location as described in section 7.3.3.

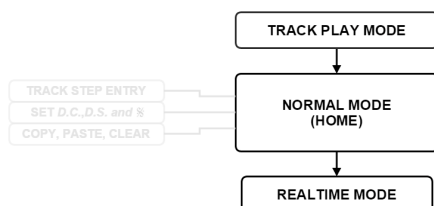
8 TRACK PLAY MODE



TRACK PLAY MODE is used to play back programmed tracks without the ability to destructively edit them.

8.1 OVERVIEW

TRACK PLAY MODE does not allow editing of pattern or track step parameters. Below is a simple graphical representation of the basic workflow of TRACK PLAY MODE:



8.2 SELECTING TRACKS

Select one of the (7) TRACKS to write to using the **TRACK / PATT. BANK** selector.



8.3 NORMAL MODE

NORMAL MODE is the only (sub) mode with TRACK PLAY MODE. Simply press **RUN** to play a track.

8.3.1 TRACK STEP INDICATORS

The current track step can be viewed on the **STEP BUTTON & BUTTON 1-4 LED's** as described in section 7.3.1.

8.4 REALTIME MODE

In REALTIME MODE track steps can be manipulated realtime by overriding transpose, accent, slide, and mod env. settings.

8.4.1 REALTIME ACCENT & SLIDE

Accent and Slide can be *played* to trigger accents and slides.

To override pattern step data with accents and/or slides, press **[PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to accent steps press and hold **[PITCH] + [ACCENT]**.



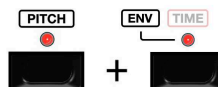
Accent and Slide can also be *played* realtime to mute accents and slides.

To override pattern step data and mute accents and/or slides, press **[FUNCTION] + [PITCH] + [ACCENT] / [SLIDE]**. For example, to force a pattern to mute accents press and hold **[FUNCTION] + [PITCH] + [ACCENT]**.



8.4.2 REALTIME MOD ENV

The modulation envelope can be triggered in realtime by pressing **[PITCH] + [ENV]**. Each time the button combination is pressed the modulation envelope will be triggered.

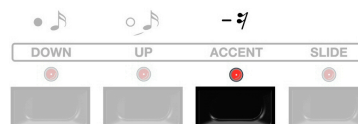


To mute modulation envelope triggers to prevent it from being triggered press **[FUNCTION] + [PITCH] + [ENV]**.



8.4.3 REALTIME MUTE

Rests can be played realtime to override the pattern time data. This selectively mutes the pattern. This is done by pressing **REST #**.



9 MIDI PLAY

The Avalon can be used as a MIDI sound module. This allows the internal synthesizer to be sequenced or played as a traditional monosynth from an external MIDI device.

hardware midi controller it can be mapped to a button set to non-latching mode (parameter values 0 & 127). If controlled from a software sequencer set the controller value to 64-127 when a trigger is desired. The duration of the MIDI event is not important, it only requires a short pulse.

9.1 STOP THE SEQUENCER

In order to play the Avalon as a MIDI sound module the sequencer must be stopped.

9.2 SET MIDI INPUT CHANNEL

Set the MIDI Input Channel as described in section 10.1.3.

9.3 DISABLE MIDI SYNC

In order to play the Avalon as a MIDI sound module MIDI SYNC must be disabled as described in section 10.1.1.

9.4 MIDI RECEIVE PARAMETERS

The Avalon receives the MIDI parameters listed below:

- 1) Note On / Velocity / Slide
- 2) VCA Level
- 3) Filter Cutoff
- 4) Modulation Envelope Trigger

9.4.1 NOTE ON / ACCENT/ SLIDE

Note Range: 18-75 (F#0 to D#5)

Velocity Range:

- Accent Off = 0-63
- Accent On = 64-127

Slide: Overlapping Notes

i *There are only on/off states for accent... accents are triggered with a note on velocity value of 64-127.*

9.4.2 VCA LEVEL

VCA Level is a control input to the final amplifier (VCA). This will add a volume offset to the VCA.

Controller Number: 1

Controller Value: 0-127

9.4.3 FILTER CUTOFF

Controller Number: 74

Controller Value: 0-127

9.4.4 MODULATION ENVELOPE TRIGGER

Controller Number: 80

Controller Value: 0-127

- Mod Env Off = 0-63
- Mod Env On = 64-127

i *There are only on/off states for MOD ENV. The envelope is triggered with a controller value of 64-127. To retrigger the envelope the trigger must be reset by sending a controller value of 0-63. If controlling from a*

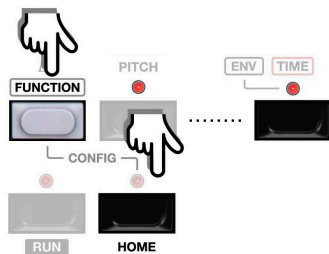
10 CONFIGURATION MODE

Configuration mode is used for setting the following system parameters:

- 1) Sync Input
- 2) Sync Output
- 3) MIDI In Ch
- 4) MIDI Out Ch
- 5) USB MIDI
- 6) LED Dimming
- 7) OS Version

10.1 ENTER CONFIG MODE

To enter configuration mode press **[FUNCTION] + HOME** (the buttons can be pressed in either order). When configuration mode is entered the **[PITCH LED]** and **[TIME LED]** will light solid.



tip Configuration mode can be entered and parameters modified while the sequencer is running.

10.1.1 SYNC INPUT

The sequencer can be controlled via the internal clock, MIDI clock, or DINSync. To set the SYNC IN source once inside CONFIG MODE press **SYNC IN + STEP BUTTON 1-3**. The three sync input options are indicated by the text below **STEP BUTTON 1-3**.



- **STEP BUTTON 1** = Internal Clock
- **STEP BUTTON 2** = MIDI Clock
- **STEP BUTTON 3** = DINSync

10.1.1.1 MIDI SYNC IN BEHAVIOR

When MIDI Sync is enabled the Avalon will automatically begin playback when a MIDI start or continue message is received. The sequencer tempo will lock to incoming MIDI clock messages after receiving a MIDI start message. When a MIDI stop message is received, the Avalon will revert back to internal clock.

The internal clock generator always runs independently, regardless of the MIDI sync setting, enabling the sequencer to be started by pressing the **RUN** button, even when being controlled from external MIDI

If a MIDI start is received after the internal clock is started, the Avalon will automatically switch to MIDI sync, and then back to internal clock when MIDI stop is received without stopping the sequencer.

A subsequent MIDI start will restart the current pattern at the first step, allowing the sequencer to continue uninterrupted playback while remaining in sync. This is very useful for live performance.

10.1.2 SYNC OUTPUT

The sequence can output MIDI and DINSync clock.

- To enable MIDI Sync Out press **SYNC OUT + STEP BUTTON 2**
- To enable DINSync Out press **SYNC OUT + STEP BUTTON 3**

10.1.3 MIDI INPUT CHANNEL

To set the MIDI Input channel press **INPUT CH + STEP BUTTON 1-16**. For example, to set the MIDI input channel to channel 3 press **INPUT CH + STEP BUTTON 3**.



10.1.4 MIDI OUTPUT CHANNEL

To set the MIDI Output channel press **OUTPUT CH + STEP BUTTON 1-16**.

10.1.5 USB MIDI

To enable USB MIDI press **USB MIDI**. The indicator will light to show that USB MIDI is enabled. Pressing the button again will disable USB MIDI and the indicator will go off.

10.1.6 LED DIMMING

The **STEP BUTTON** indicators can be varied in brightness by pressing the buttons directly. **STEP BUTTON 1** is the dimmest, **STEP BUTTON 16** is the brightest.

When a new brightness is selected the **STEP BUTTON LED's** up to the value of the new selection will light up at the new setting.

10.1.7 OS VERSION

The OS version is displayed while pressing **[SYSTEM]**. The major version number is shown on the **PATTERN BUTTONS**. The minor version number is shown on the **STEP BUTTONS**.

10.2 EXIT CONFIG MODE

To exit configuration mode press **HOME** or **[FUNCTION]**.

11 INPUTS & OUTPUTS

The Avalon includes numerous audio and CV / Gate inputs & outputs.

11.1 AUDIO I/O

The audio I/O consists of 1/4" and 1/8" jacks on the rear panel. The 1/8" audio jacks are differentiated from the 1/8" CV/Gate I/O jacks in two ways. First, the text labels for the audio I/O on the top and rear panels of the unit are surrounded by a box. Second, the audio I/O direction indicators are shown in color (red or blue).

MAIN OUT is a 1/4" mono jack and is the main output.

PHONES is a 1/4" stereo jack and is the headphone output.

SAW & SQR are buffered +/-5V outputs of the saw and square VCO waveforms.

EXT IN is an external input to the filter. It accepts a wide range of signal levels as it has an internal preamp stage. When the external input is used the sub oscillator is bypassed.

VCA OUT is the output from the VCA before the *mixer* stage and the main out. This output can be used to feed the signal back to the filter input or to external hardware, or to simply bypass the internal *mixer* stage to improve performance by reducing noise and distortion.

11.2 CV & GATE I/O

The numerous CV & Gate 1/8" jacks are used for interfacing the Avalon with external hardware.

CV & GATE INPUTS The GATE IN 1/8" jack allows other analog devices to trigger the Avalon's envelopes. The CV IN 1/8" jack allows control of the pitch of the Avalon oscillators from an external source. When a CV input is plugged into the jack the internal sequencer pitch CV is bypassed.

GATE IN is a positive 0-5V gate.
CV IN is 1V/octave with a 0-5.333V range.

i $2V = C2 (65.4Hz)$

CV & GATE OUTPUTS are used for sending the Avalon's sequencer/keyboard CV & GATE to external analog gear.

GATE OUT is a positive 0-12V gate.
CV OUT is 1V/octave with a 0-5V range.

FILT CV is an input to the filter frequency control input and is used for modulating the Avalon filter(s) from external gear.

FILT CV is 1V/octave.

i *The Avalon Filter CV input is non-standard due the nature of the TB-303 compatibility. The resting voltage of the filter control input is 3.28V. See Appendix B for details.*

SWEEP is short for *accent sweep out* and is a control voltage output that gives a normalized and amplified copy of the accent sweep signal. This is the short burst (*wow*) envelope that is derived from the filter envelope on accented notes. This signal is 0-5V max.

12 SPECIFICATIONS

ANALOG SYNTHESIZER

Main Oscillator

- Waveform: Saw & Square
- Range: 5 Octaves

Sub Oscillator

- Waveform: Saw, Triangle, & Square
- Range: (-1) and (-2) Octaves relative

Oscillator Control

- Tune: +/-500 Cents
- Slide Time: (4) Settings (per step)

Filter A/B (common controls)

- Cutoff Frequency
- Resonance
- Filter Envelope Depth (Env Mod)
- Filter Tracking
- Modulation Envelope Depth

Filter B (additional control)

- Filter B Mode

Filter Envelope

- Decay Time
- Accent Decay Time
- Accent Depth

Modulation Envelope

- Attack Time
- Decay Time
- Filter Modulation Depth (bi-polar)
- VCA Modulation Depth (bi-polar)

VCA Envelope

- Decay Time

CONNECTIONS

Power: DC6V/2A

Audio Inputs & Outputs

- Main Output
- Headphone Output
- Saw Output
- Square Output
- Filter Input
- Filter/Amp Output

Control Inputs & Outputs

- Gate/CV In
- Gate/CV Out
- Filter CV In
- Accent Sweep Out
- USB
- MIDI In & Out
- DINSync In & Out

DIGITAL SEQUENCER

Pattern Details

- 112 Patterns (Transferable via MIDI/USB)
- Pattern Length = 64 steps maximum
- 1 Step = 1/4, 1/8, 1/16, 1/32 (includes triplet modes)
- Pattern Copy, Paste, Clear
- Shuffle - up to 8 stages
- Pattern Directions: Forward, Reverse, Pendulum, Random
- Skip Steps
- Slide Times: 50ms, 100ms (303), 400ms, 2s (per step)
- Arpeggiator - Realtime & Record modes

Pattern Memorized Content

- Per Step: Note Length, Pitch, Accent, Slide, Env Trig,
- Slide Time, Filter CV, Gate Length
- Per Pattern: Time Signature, Length, Direction, Shuffle,
- Rotate, Filter B Mode

Pattern Write Modes

- Normal Mode
- Record Mode
- Pitch & Time Step Entry Mode (303)

Tracks Details

- 7 Tracks (Transferable via USB/MIDI)
- 64 Track Steps per track
- Transpose & Repeats per Track Step
- Copy, Paste, Clear, Dump
- Realtime Accent, Slide, Env Trg, Rest

Track Memorized Content

- Order of Patterns
- Transposition per Track Step
- Repeats per Track Step
- Cue (Loop) Points

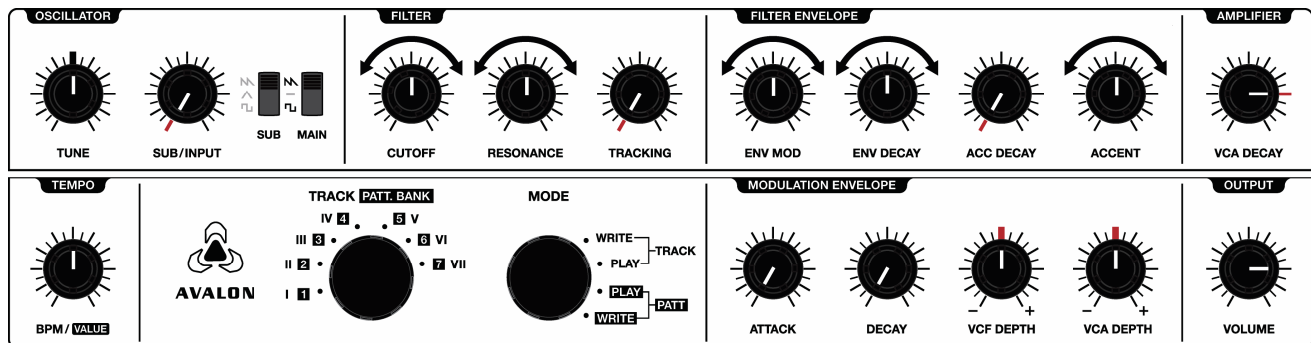
Sequencer Primary Controls

- Tempo: 40~300BPM
- Primary Modes: Pattern Play/Write, Track Play/Write
- Chromatic Keyboard
- Pattern/Bank Select Buttons
- Step LED Buttons
- Function (Secondary) Menu
- Run/Stop

DIMENSIONS

- 346mm (13.62")W x 172mm (6.77")D x 45mm (1.77")H
- 352mm (13.86")W x 176mm (6.93")D x 65mm (2.56")H w/ Hardware & Feet:
- Weight: 5.2lbs (2.36kg)

13 TB-303 SETTINGS



13.1 ANALOG VOICE

The analog voice is backwards compatible with the TB-303. The additional features can be viewed as a *layer on top* of the original TB-303 subset of controls. To limit the Avalon sound capabilities to that of the TB-303 use the settings as shown above and described below:

13.1.1 OSCILLATORS

The sub oscillator should not be used. Set the **SUB/INPUT** control to the minimum setting.

13.1.2 FILTER

If the exact **CUTOFF** range of the TB-303 is desired see Appendix A for adjustment options. The Avalon ships with default settings that give an extended range.

TRACKING should be set the minimum (off) setting as it is not found on the TB-303.

13.1.3 FILTER ENVELOPE

If the exact range of **ENV MOD** (filter envelope modulation) is desired see Appendix A for adjustment options. The Avalon ships with default settings that allow envelope modulation to be turned off completely when the control is at the minimum setting.

Set the **ACC DECAY** control to minimum as this corresponds to the fixed setting of the TB-303.

13.1.4 VCA ENVELOPE

The TB-303 has a fixed VCA Decay time of 3s. This is equivalent to the 3 o'clock position of the **VCA DECAY** control.

13.1.5 MODULATION ENVELOPE

The modulation envelope should not be used. Set the **VCF DEPTH** and **VCA DEPTH** controls to the center-off position.

13.2 SEQUENCER

To limit the sequencer to TB-303 behavior you'll have to ignore several pattern write modes and the additional pattern step attributes.

13.2.1 PATTERN WRITE MODES

To program the sequencer like the TB-303 use PITCH & TIME STEP ENTRY MODES as described in section 5.3. You will still need to set the pattern length as described in section 5.2.3.1.

The TB-303 does not include the following pattern write modes:

- Normal Mode
- Realtime Mode
- Record Mode

13.2.2 PATTERN MODIFIERS

Do not use the following pattern modifiers (*the default settings correspond to the TB-303*):

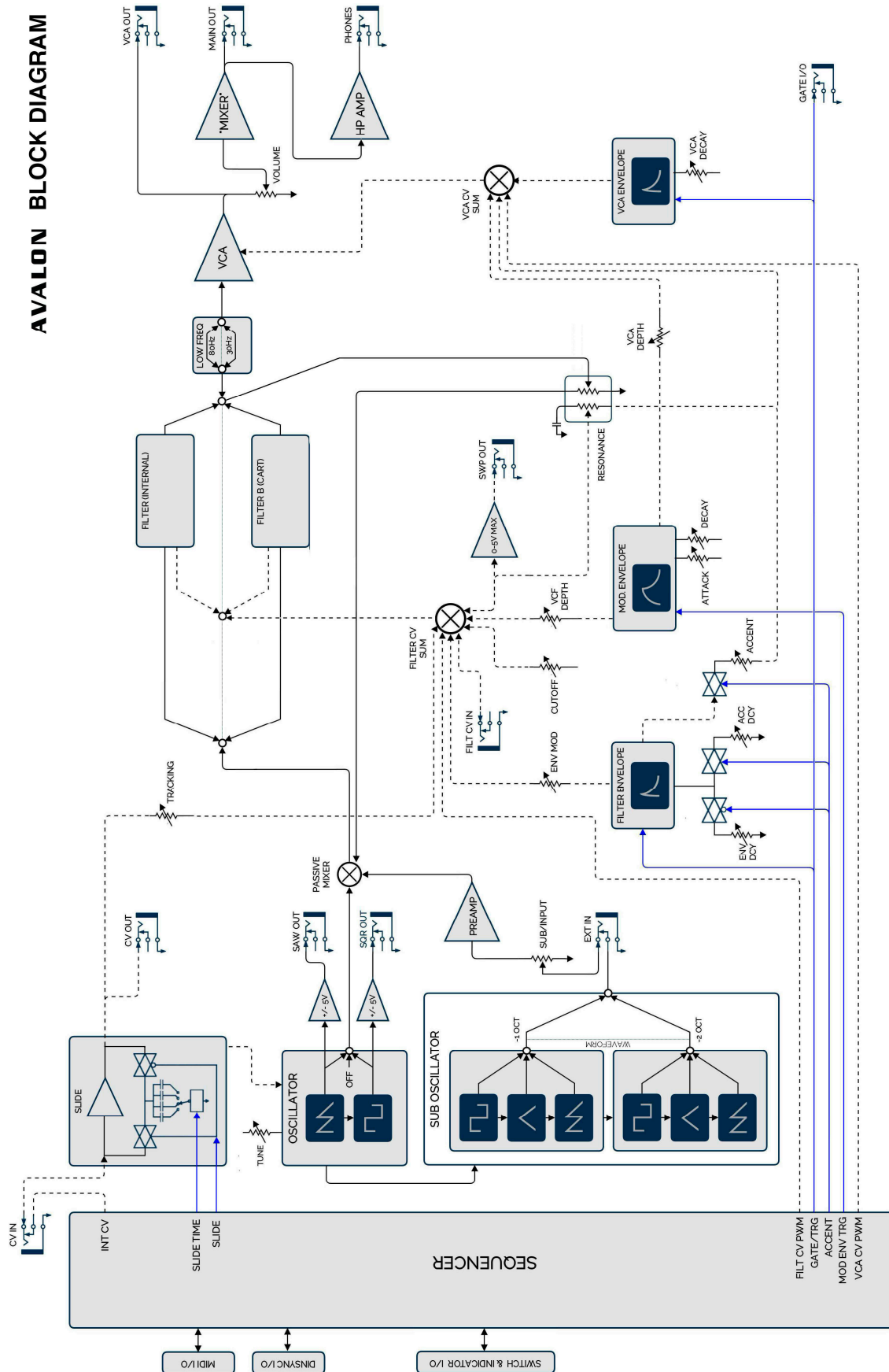
- Pattern Length (use 16 steps max)
- Pattern Direction
- Shuffle
- Pattern Rotate
- Pattern Randomize
- Filter B Mode

13.2.3 PATTERN STEP ATTRIBUTES

Do not use the following step attributes (*the default settings correspond to the TB-303*):

- Modulation Envelope Triggers
- Slide Time
- Filter CV Offset
- Gate Length
- Active Steps

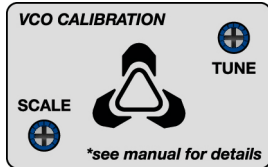
AVALON BLOCK DIAGRAM



APPENDIX A - CALIBRATION

1 VCO CALIBRATION

The oscillator can be calibrated through the two holes in the bottom of the unit.



- Set **TUNE** to center position.
- Place the synth into PATTERN WRITE MODE.
- Using a frequency counter or tuner, monitor the SAW OUTPUT from the 1/8" jack on the rear of the unit.
- Play note C2 by pressing **[PITCH] + [BUTTON KEY C]**. Once the key has been pressed it can be released and the oscillator will continue to play.
- Adjust the TUNE trimmer until the frequency is close to 65.4Hz.
- While playing notes C2 and C3 adjust the SCALE trimmer until the scale between C2 and C3 is one octave (approx. 65.4Hz & 130.8Hz). To play notes C2 and C3 press **[PITCH] + [BUTTON KEY C]** and **[PITCH] + [BUTTON KEY C']** respectively.
- Repeat the TUNE and SCALE adjustments until the frequency and width is correct.

tip When adjusting SCALE the TUNE frequency will shift so you will need to repeat steps e) and f) a few times to dial in the calibration.

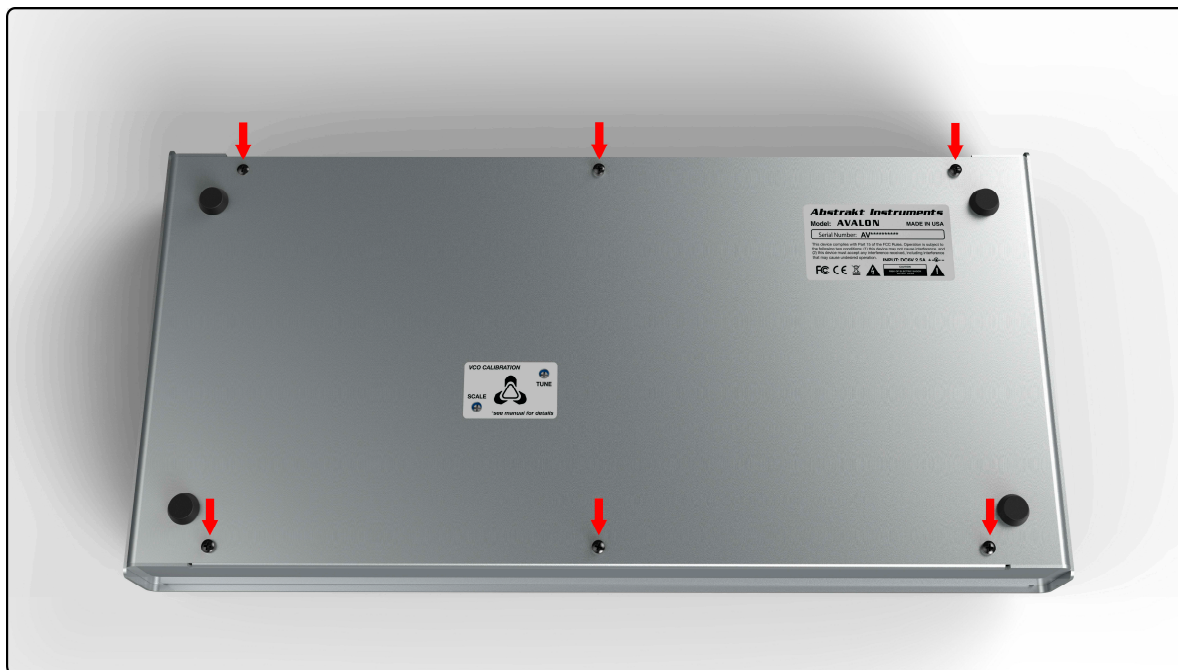
tip If you need an additional output for audible feedback use the **SQUARE OUTPUT**.

i Use only the included trimmer tool or equivalent or the trimmers will likely be damaged. Suitable replacements are Bourns Part # H-90 or Vishay Part # ACCTRIB308. These are available from your electronics supplier or from our online store.

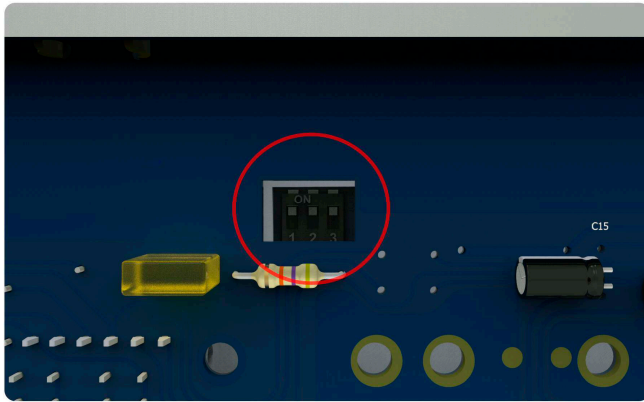
2 INTERNAL FILTER ADJUSTMENTS

i These adjustments should only be performed by a qualified technician.

There are (3) internal adjustments relating to the filter. These adjustments allow the filter controls to retain the same behavior as the TB-303 controls or to allow an extended range. To access these switches the bottom cover of the synth needs to be removed. To remove it unscrew the (6) M3 metric screws. A Phillips #2 JIS (Japanese industrial standard) screwdriver should be used.



Once the bottom cover is removed the DIP switch can be viewed through the hole in the PCB.



The ON position for these DIP switches is towards the top of the unit (*all switches in the graphic above are in the ON position*).

a) SWITCH 1: **CUTOFF** low end range. This switch sets the low end of the cutoff range allowed by the **CUTOFF** knob. The TB-303 low cutoff range is limited. This switch allows for extended range.

- **OFF:** TB-303 setting (minimal range)
- **ON:** Extended range (*default)

b) SWITCH 2: **ENV MOD** minimum depth. This switch sets the ENV MOD depth when the control is at the minimum position. The TB-303 doesn't allow the filter envelope modulation to be turned all the way off, and there's still some modulation when the control is at the minimum setting. This switch allows for ENV MOD to extend to "off" when the **ENV MOD** knob is at its minimum setting.

- **OFF:** ENV MOD goes to "off" (*default)
- **ON:** TB-303 range

c) SWITCH 3: **ENV MOD** maximum amount. This switch sets the maximum filter envelope modulation amount when the control is at the maximum setting. When enabled the maximum modulation depth is doubled versus the default setting.

- **OFF:** TB-303 setting (*default)
- **ON:** Extended amount

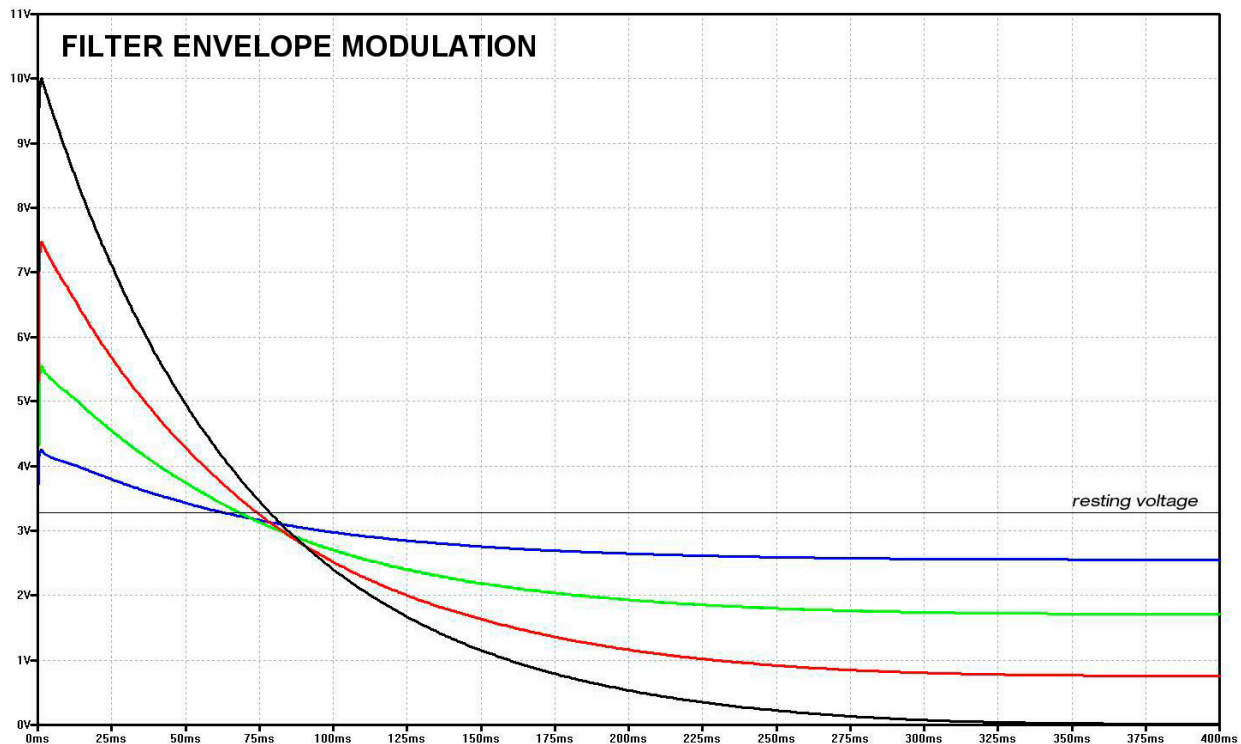
1 FILTER CONTROL INPUT BEHAVIOR

Because the Avalon's filter control input is based on the TB-303, and the TB-303 is a battery powered 'single supply' instrument, the resting state of the filter control input is set to a positive voltage in order to allow for negative modulation. This value is 3.28V. Because of this, a control voltage input less than 3.28V will decrease the filter cutoff frequency and an input greater than 3.28V will increase the cutoff frequency. The control input can be viewed as a standard 1V/octave input simply offset by 3.28V.

1.1 EFFECTS ON FILTER ENVELOPE

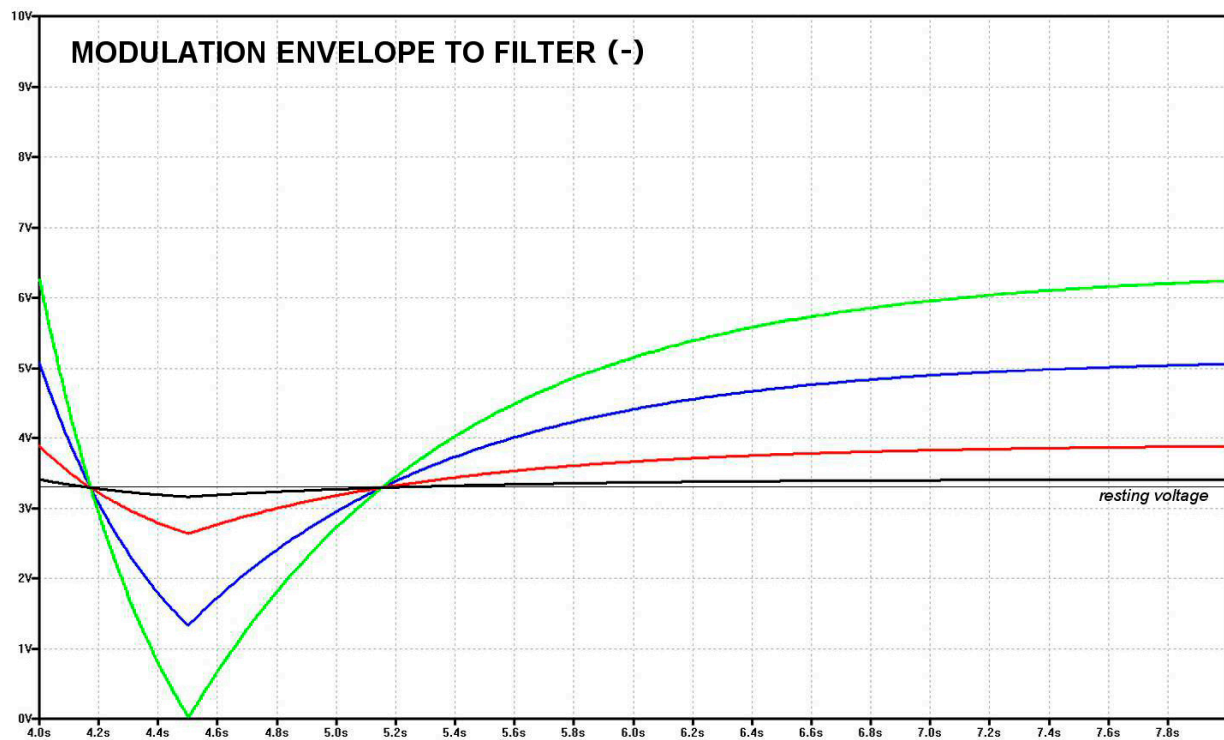
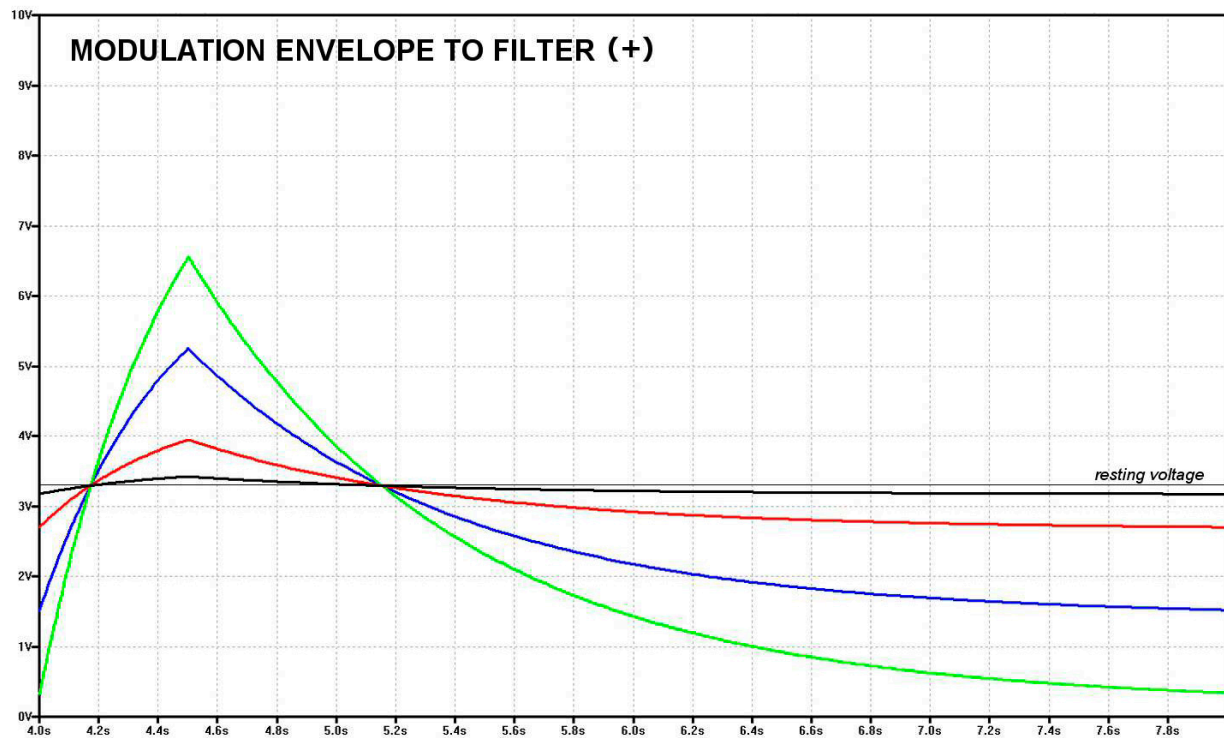
If you pay particular attention to the way the filter envelope effects the filter throughout the range of the **ENV MOD** control you may notice some peculiar behavior. If you have a more experimental approach and prefer to find good sounds and settings without particular attention to what's going on *behind the scenes* you may not want to read this. If you are more analytical and wanted to understand the machine behavior and what the adjustments are doing you may be interested in what follows:

You will notice that for increasing **ENV MOD** amount the filter decays to a lower frequency, so for increasing **ENV MOD** the control voltage has a greater range but also has a progressively negative offset. The graph below shows what's happening. As the **ENV MOD** amount is reduced the control voltage converges towards the filter resting voltage of 3.28V. The reason for this is that the filter envelope is a 0-10V control voltage, but the ENV MOD control is referenced to the filter resting voltage, so the *less* ENV MOD the *more* the filter envelope converges to the reference.



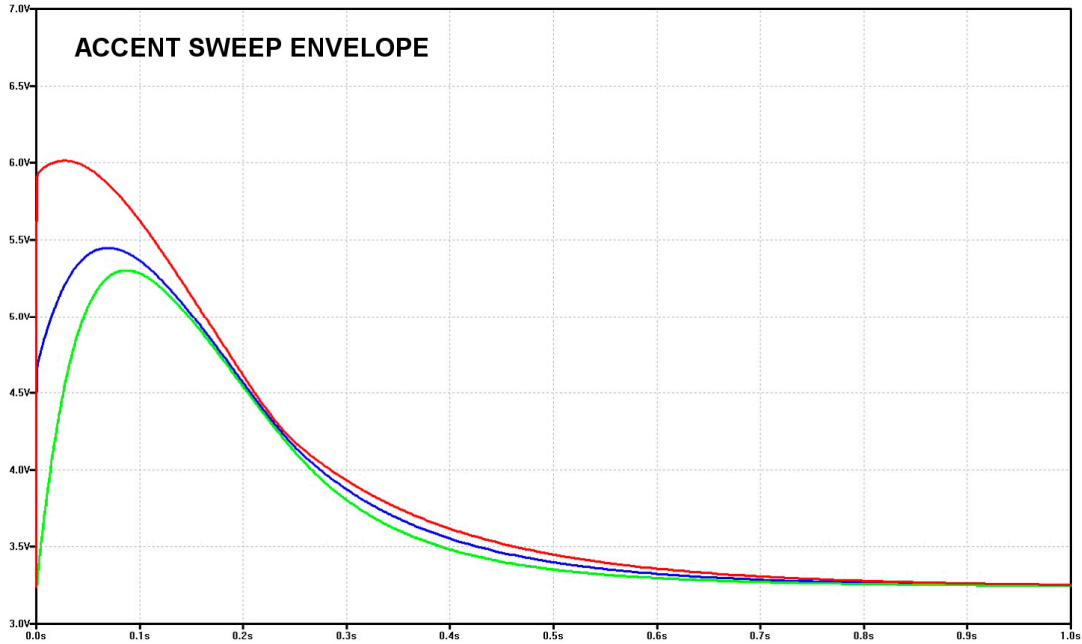
1.2 EFFECTS ON MODULATION ENVELOPE

The control voltage from the MODULATION ENVELOPE to the filter is progressively offset in the same way as ENV MOD above. This allows for a wider range of complex modulation. As the VCF DEPTH amount is decreased from (+) modulation towards the center *off* position the control voltage converges to 3.28V. Likewise, as the VCF DEPTH amount is decreased from (-) modulation towards the center *off* position the control voltage also converges to 3.28V.



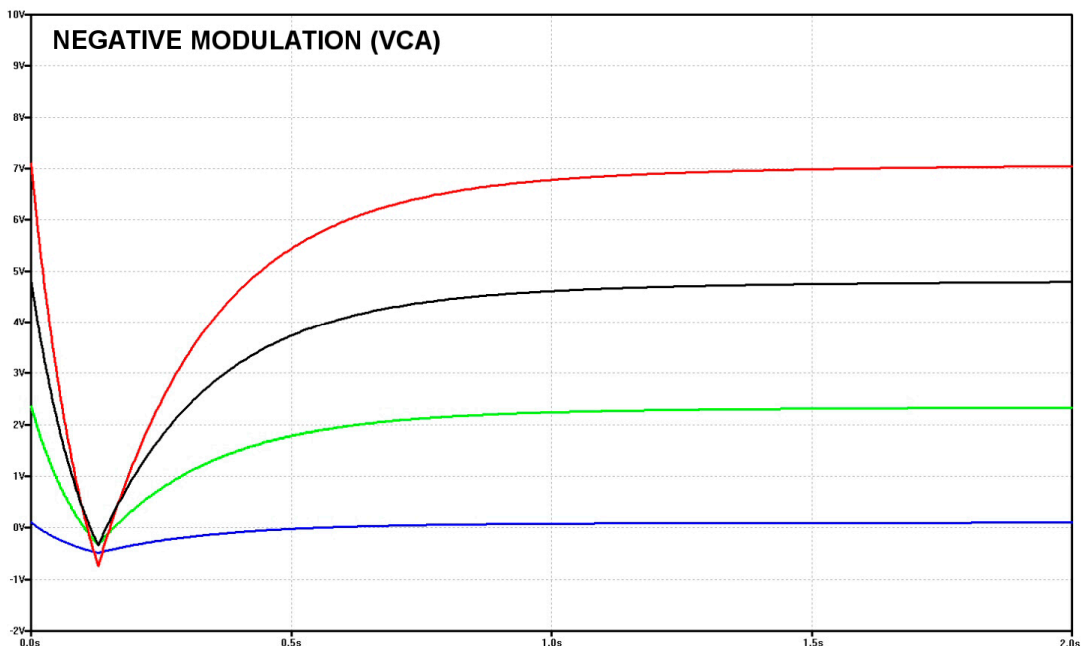
2 ACCENT BEHAVIOR

When an accent has been programmed (or played) an additional control voltage (envelope) is sent to the filter and final amplifier (VCA). A slewed copy of the filter envelope is sent to the filter control input. This is responsible for the characteristic *wow* sounds you can get with accented notes. The character of this slewed version also varies with the setting of the **RESONANCE** control, as increasing resonance also increases the slew of this control voltage. The plot below shows an example of this *accent sweep envelope* at maximum accent setting for minimum, mid, and max setting of the resonance control.



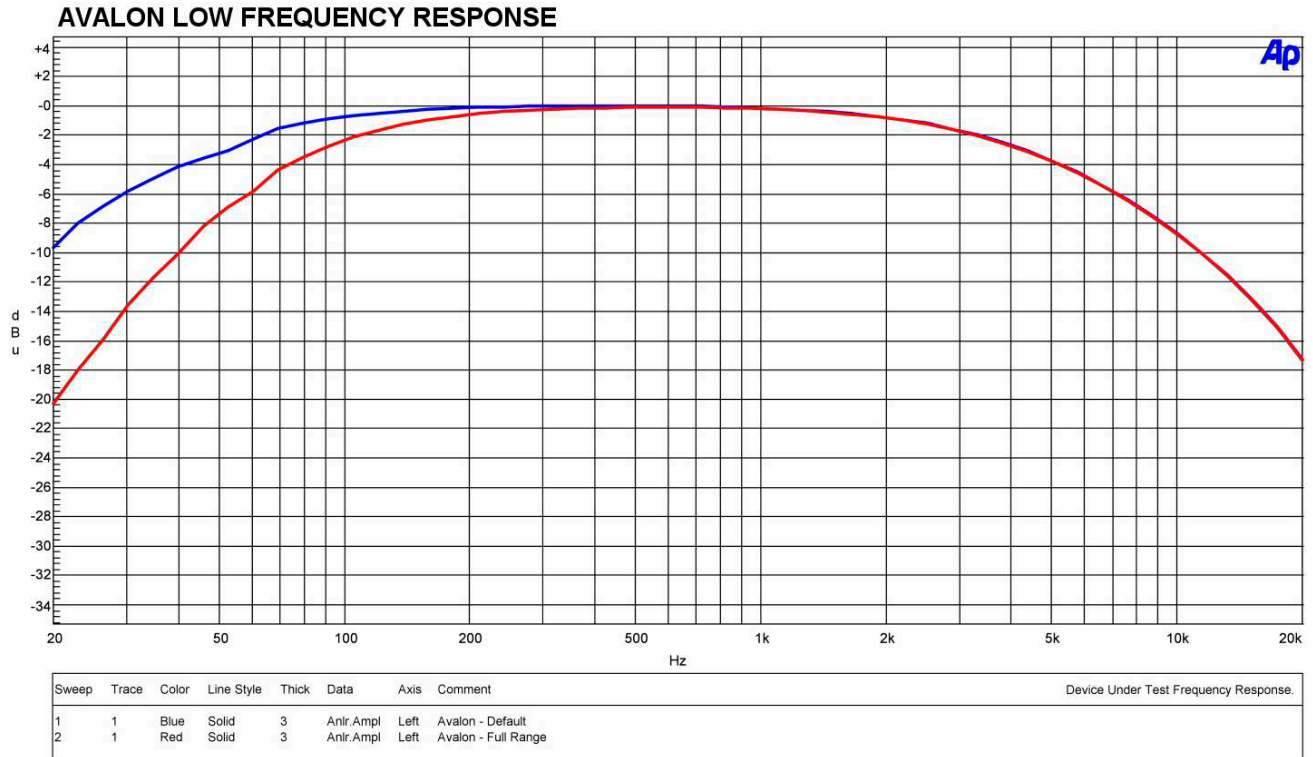
3 MODULATION ENVELOPE VCA DEPTH

VCA DEPTH has been designed with a progressive voltage offset for negative (-) modulation amounts. When the control is rotated counter-clockwise for (-) modulation a *positive* offset is applied to the VCA control input. For example, when VCA Depth is set to a negative amount and the modulation envelope is not triggered, the VCA will remain open (drone). The plot below shows the behavior of (-) modulation for (4) settings of negative **VCA DEPTH**.



3 VCA FREQUENCY RESPONSE

The **FR** switch selects the low frequency response of the audio signal to the VCA. When the switch is in the 'out' position the frequency response rolls off at 70Hz. When the switch is pushed to the 'in' position the frequency response extends down below 30Hz.



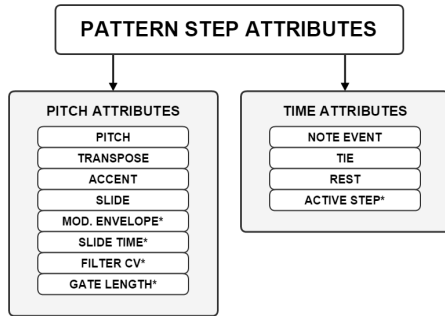
APPENDIX C - AVALON VS. TB-303 SEQUENCER

1 AVALON VS. TB-303 PATTERN STRUCTURE

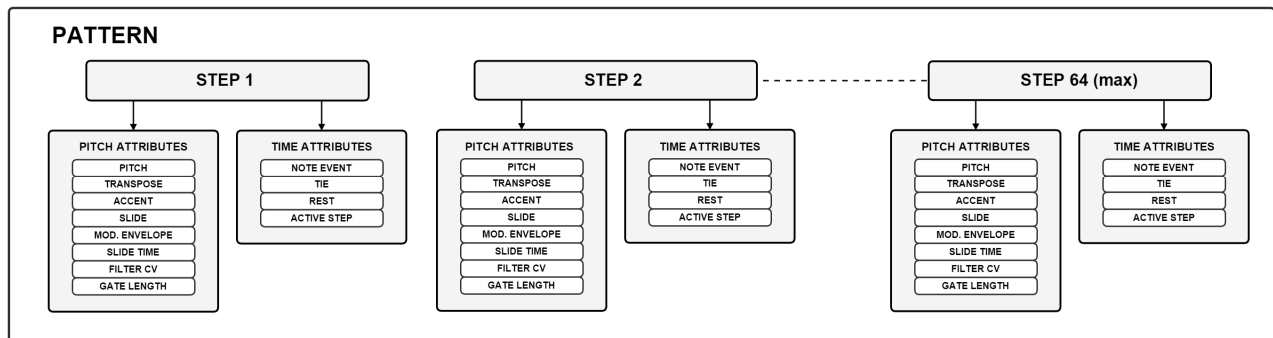
The pattern structure of the Avalon and TB-303 differs in the way that pitch & time data are stored. The Avalon saves pitch & time attributes together as a pattern step. The TB-303 has independent pitch and time steps for each pattern, they are not saved 1-to-1 as a pattern step.

1.1 AVALON PATTERN STRUCTURE

As shown below, pitch & time attributes are saved together as a pattern step.



Every time the pattern step is advanced *both* pitch & time attributes are advanced, hence a series of pitch & time attributes *always* correspond 1-to-1 to define a *pattern step*.

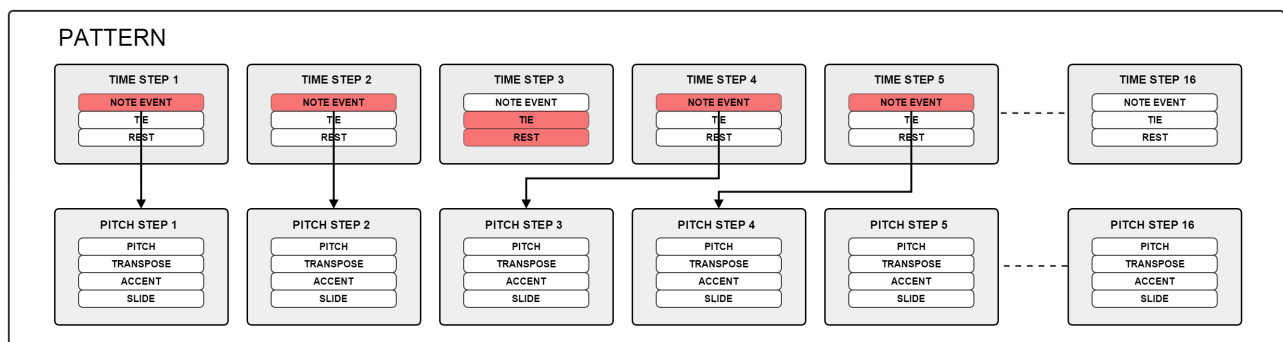


Pattern steps correspond directly to the step button indicators on the control surface of the Avalon:



1.2 TB-303 PATTERN STRUCTURE

TB-303 pitch and time attributes are always programmed separately. A pattern consists of independent sequences of *pitch steps* and *time steps*. Pitch step attributes are only advanced when a note event occurs in the sequence of time steps. As a result, the series of pitch step attributes does not always correspond 1-to-1 with the series of time steps. Specifically, if a tie or rest is programmed on a time step, the pitch step is not advanced. This is shown in the graphic below - Time Step 3 does not have a note event programmed, it's a tie/rest, so the pitch step is not advanced.



2 STEP BUTTONS

The Avalon has several pattern write modes as detailed in sections 5.2 - 5.5. All of these pattern write modes make use of the STEP BUTTONS. This is a major addition to the traditional TB-303 style step sequencer, as these button indicators are used for parameter entry and visual feedback. The STEP BUTTONS correspond 1-to-1 with the pattern steps.

In PITCH ENTRY MODE, when a pitch is entered, the step advances automatically like the TB-303. In addition, the STEP BUTTONS also show the current pattern step as it automatically advances.

In TIME ENTRY MODE, when a time attribute is entered, the step advances automatically. In addition, the STEP BUTTONS also show the current pattern step as it automatically advances. The pattern step advances regardless of whether the time attribute is a note event, tie, or rest.

3 WHERE IS TAP MODE?

TAP MODE is an alternative method in the TB-303 for programming time steps by *playing* time steps realtime while the sequencer is running. TAP MODE is superseded by RECORD MODE in the Avalon. RECORD MODE allows both pitch *and* time information to be programmed realtime via the control surface or from an external MIDI device.

APPENDIX D - MIDI IMPLEMENTATION

Manufacturer: ABSTRAKT INSTRUMENTS Model: AVALON		Version:1.0	Date: JULY 7 2015	
		Transmit/Export	Recognize/Import	Remarks
1. Basic Information				
MIDI channels		1 -16	1 - 16	Channel settings can be set independently.
Note Numbers		18-75	18-75	Valid note range F#0 to D#5. Other notes ignored.
Program Change		No	No	
Bank Select Response		No	No	
Modes supported:	Mode 1: Omni-On, Poly	No	No	
	Mode 2: Omni-On, Mono	No	No	
	Mode 1: Omni-Off, Poly	No	No	
	Mode 1: Omni-Off, Mono	No	No	
	Multi Mode	No	No	
Note-On Velocity		No	Yes	(2) velocity levels, 0..63 = No Accent, 64..127 = Accent.
Note-Off Velocity		No	Yes	Note off velocity = 0.
Channel Aftertouch		No	No	
Poly Aftertouch		No	No	
Pitch Bend		No	No	
Active Sensing		No	No	
System Reset		No	No	
Tune Request		No	No	
Universal System Exclusive	File Dump	Yes	Yes	Transmission of patterns and tracks.
2. MIDI Timing and Synchronization				
MIDI Clock		Yes	Yes	
Song Position Pointer		No	No	
Song Select		No	No	
Start		Yes	Yes	
Continue		Yes	Yes	
Stop		Yes	Yes	
MIDI Time Code		No	No	
MIDI Machine Control		No	No	
MIDI Show Control		No	No	
3. Extensions Compatibility				
General MIDI compatible?		No	No	
DLS compatible?		No	No	
Standard MIDI Files		No	No	
XMF Files		No	No	
SP-MIDI compatible		No	No	
4. Control Number Information				
Control #	Function	Transmitted	Recognized	Remarks
1	Modulation Wheel (MSB)	No	Yes	0..127, VCA volume offset
74	Brightness	Yes	Yes	0..127, Filter Cutoff.
80	Modulation Envelope Triggers	Yes	Yes	0..63 = MOD ENV TRG OFF, 64..127 = MOD ENV TRG ON

Abstrakt Instruments
1010 Ocean Dr
Hermosa Beach CA 90254
USA

© 2015 Abstrakt Instruments
www.abstraktinstruments.com

00193-001 06-2015